

# Railway Age

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## Did This Ever Happen on Your Road?

AN order for repair parts is said to have been placed by a railroad with the builder of a machine tool which had been purchased by the railroad 25 years ago. These parts at present prices cost almost as much as had been paid for the machine itself when it was purchased. The builder believing that to put this much money into such a machine would simply be wasting the money because the machine had been built before the advent of high speed steel cutting tools and could, therefore, according to modern standards, be sold for nothing but junk, concluded that the mechanical department officer responsible for the order was making a mistake. He, therefore, sent a representative to try to convince the mechanical officer how much better it would be for the railroad to buy a modern machine that would cost about two and one-half times what the repairs to the old machine would cost. The representative found that the mechanical officer was as thoroughly informed on this phase of the situation as he was himself. He knew that it was a waste of money to repair the old machine and that the waste would continue as long as it remained in service because of its light cuts and slow operation. But authority had been refused for the capital expenditure required to purchase a new machine of this type and the mechanical officer had no recourse but to repair the old machine, the cost of the job going into operating expenses which did not require the approval of the executive before the expenditures were incurred. Did the executive who refused the authority know what he was wasting? If he knew, what was his justification?

## Legislative Interference in Rate-Making in Canada

IT is not only in the United States that politicians are attempting to tamper with rate-making over the heads of the expert body to which it has been entrusted. Canada is menaced with the same threat and in much more serious proportions. Whereas south of the international border the only question wherein legislative interference is threatened has to do with a relatively small portion of railway revenue, in Canada action on nothing less than the whole freight rate structure of the Dominion is being agitated in Parliament. This agitation takes the form of demands by the agrarian politicians of the Prairie provinces for complete and final restoration of the ruinously low Crow's Nest Pass rates. These rates are temporarily in force now, pending action by the Canadian Supreme Court. Whatever the outcome of this case, however, it is generally recognized that highly discriminatory rates cannot be permitted. Ergo, if the Crow's Nest rates must stand, rates in other sections of the Dominion must be similarly reduced. And this would mean ruin. There is one solution of the rate problem and one only and that is to leave it in competent hands. In Canada this means the Board of Railway Commissioners just as it means the Interstate Commerce Commission in the United States.

Incidentally, inasmuch as the Canadian National Railways were to be left by the legislators to work out their problems the same as a private corporation, why the continued agitation by the Maritime provinces for the routing of freight through their ports to the exclusion of C. N. R. ports in New England? There could not possibly be any interference with railway operation which would savor more of politics than arbitrary rules for the moving of freight over favored, though uneconomic, routes. Fortunately, the agitators from the Maritimes have not been able thus far to secure legal powers for enforcing their desires.

## A New Kind of a Convention

THE Signal Section of the American Railway Association will devote an entire day, Friday, March 13, of its annual convention to be held at the Drake Hotel, Chicago, to papers on various phases of the operation of trains by signal indication. Twenty papers have been prepared by railway officers who have collected statistics on the use of signals on single track and on multiple track lines for the movement of trains with and against the current of traffic, showing the results that are being accomplished in daily practice. These papers will be accompanied by slides illustrating the methods of operating trains by signal indication. The Signal Section invites engineering, operating, mechanical and other railway officers to attend the meetings and participate in the discussion. It is hoped that engineering officers attending the convention of the American Railway Engineering Association will stay over an additional day to attend this meeting and that there will also be a large attendance of operating men located in or near Chicago. The signal engineers have arranged this program in order to present the facts regarding the movement of trains by signal indications with the hope that they will secure the criticism, advice and co-operation of other officers interested in facilities aiding train movement and increasing track capacity by this means.

## The "Seven-Day Week"

SOME correspondence recently published by B. C. Forbes in his daily column in the Hearst newspapers has called forth a flood of letters from railway employees who complain that they work seven days a week. The first employee who wrote to Mr. Forbes asserted that railway employees in general work seven days a week. This, of course, was an exaggeration. The statistics of the Interstate Commerce Commission indicate that the average employee works 300 days a year, while the average general or divisional officer works 312 days a year. It is undeniable, however, that some railway employees do work seven days a week. The average in 1923 for transportation employees (other than those engaged in train, engine and yard service) was 348 days for those paid on a daily basis, and 321 days for those paid on an hourly basis.

The average for yardmasters, switch-tenders and hostlers was 348 days for those paid on a daily basis and about 343 days for those paid on an hourly basis. These averages indicate that many employees of these classes work practically seven days a week. Mr. Forbes takes the position that the seven-day week on the railroads or in any other industry is an evil which the industry itself should try to remedy or abolish. It is difficult to find a reasonable argument against this position. As a matter of principle no man should be required or expected to work every day in the year no matter what his work is, if it is avoidable. The problem the situation presents to the railways, however, is a peculiarly hard one. They must operate seven days a week. There are many kinds of railway work for which it would be found extremely difficult to provide extra men in order that each employee might have a day off weekly. Because the problem is a difficult one, however, is not a sufficient reason why it should not be tackled by the managements. Unless the managements make a real effort to solve it themselves, as far as it is soluble, it is pretty sure sooner or later to become the subject of legislation. Employees could present a much better case for legislation against the seven-day week than for much other legislation they have got passed. It would be wise for the management of each railway to undertake a study to determine how far it would be practicable for it to go toward abolishing the seven-day week on its lines.

## Railway Wages and Cost of Living

THE railway labor leaders, following the defeat of the Howell-Barkley bill, have set up a loud outcry against the railway presidents and the Railroad Labor Board. The burden of their complaint is that the railway presidents are attacking the labor unions and that the employees cannot get justice from the Railroad Labor Board.

As indicated in another editorial in this issue, the long statement they have issued is evidently intended as a smoke screen to blind the public to a movement they apparently are starting to get a general advance in wages without the matters in controversy first being heard and passed upon by the Labor Board. It is, therefore, pertinent at this time to present the actual facts regarding the way that railway employees have fared since the Transportation Act became a law and the Labor Board has been functioning under it. The facts are best shown by comparing the changes that have been made in railway wages with the changes that have occurred in the cost of living.

The *Railway Age* pointed out in an editorial published in its issue for February 14 that in every year since 1913, except 1919 when the railways were under government operation, the average annual earnings of railway employees have shown a greater increase than the cost of living as reported by the Bureau of Labor Statistics. It was shown in that editorial that in 1924 the cost of living averaged only about 70 per cent more than in 1913 while the average earnings of employees during the year were 112 per cent more, and that therefore the average employee could have lived as well in 1924 as he did in 1913 and saved over \$300 more of his wages; or, if he chose to live better, could have spent over \$300 more in doing so.

But this is not the whole story. In addition to getting an increase in his annual earnings largely exceeding the increase in the cost of living, the average employee since 1913 has been given a reduction of about two hours in

his average working day. The fact that his hours of work have been reduced while his average annual earnings have more than doubled means, of course, that there has been a relatively very large increase in his average earnings per hour. The reduction in their working hours has been an advantage gained by employees in addition to the increase in their annual earnings. The true measure of both of these forms of advantage gained by them is the increase in their average hourly wage. Furthermore, the increase in the average hourly wage is the true measure of the increase in the cost of labor to the railways.

How much then has been the increase in the average hourly wage of railway employees as compared with the increase in the cost of living? How much in particular has been the increase in their average hourly wage as compared with the cost of living since the much abused Railroad Labor Board has been functioning?

The table given herewith shows that in 1918 and every year since, using the statistics of 1913 as a basis, the average hourly wage of railway employees has been largely in excess of the cost of living. Furthermore, it shows that under the much abused Transportation Act and Railroad Labor Board the railway employees have fared much better than they did under government control.

TABLE I  
HOURLY RAILWAY WAGE AND COST OF LIVING

Year	Average hourly wage	Per cent	Cost of living
1913.....	23.8 cents	100	Dec. 1913 100
1918.....	45.8 cents	192	Dec. 1918 174
1919.....	56.5 cents	237	Dec. 1919 199
June 1920.....	72 cents	303	June 1920 216
Dec. 1920.....	72 cents	303	Dec. 1920 200
1923.....	61 cents	256	Dec. 1923 173
11 mos. 1924.....	64 cents	269	
Nov. 1924.....	65.3 cents	274	Dec. 1924 172.5

Between 1918 and 1919 the cost of living increased almost 14 per cent and the Railroad Administration advanced the average hourly wage 23.4 per cent. Between December, 1919, and December, 1920, there was virtually no increase in the cost of living but in December, 1920, the average hourly wage was almost 24 per cent more than it was in December, 1919.

The large advance in wages made by the Railroad Labor Board in 1920 was awarded on July 20 but made retroactive to May 1. Wages have been reduced since then, but so has the cost of living. How have the employees fared since then? Between June, 1920, just after the large advance in wages of that year went into effect, and December, 1924, the decline in the cost of living was 20 per cent and between December, 1920, and December, 1924, it declined 14 per cent. In the first eleven months of 1924 the average wage per hour was only eleven per cent less than after the advance in wages was granted in 1920 and in November, 1924, it was only 9.3 per cent less.

In other words the Railroad Labor Board in 1920 granted advances in wages relatively larger in proportion to the increase in the cost of living than had been granted under government control. Since then reductions of wages have been relatively less than the decline in the cost of living and the average employee can now buy more of all the things he needs with an average hour's wage than he could in 1920 when the average wage was the highest in history.

Railway employees have no reasonable grounds for complaint regarding the way they have been treated in respect to their wages or working conditions under the labor provisions of the Transportation Act as they have been carried out by the Railroad Labor Board and the railway companies. The true reason for the war the leaders of the unions are waging upon the board is that it is an obstacle to the use by them of strikes and threats of



strikes as a means of terrorizing the railway companies and the public into granting their demands. We can easily understand the policy they have followed and are still following in trying to destroy the Labor Board. We cannot understand why railway employees should support that policy.

## Are Railroad Men Proud of Their Industry?

RAILROAD men of this continent have in their industry and its efficiency an achievement of which they can well be proud. Not only has North America built a much greater railway mileage than any other continent; it also has developed what are, in many respects, the most efficient railways. This last statement is not a mere vain boast. As is generally recognized, American railroad genius (and when the word American is used in connection with railroads it generally implies Canadian as well) has been devoted largely to the development of economical transportation for heavy freight. And—we think it can be said without likelihood of contradiction—the American railroads stand far above those of the rest of the world in their accomplishment in this field. To say this is not to toss an oversized bouquet at the American railroads. With so large a proportion of the world's railway mileage, they would be decided failures if they had not to their credit greater accomplishments in the solution of their peculiar problems than other countries.

But our railroad problem is not entirely peculiar to America. There are other lands where the most effective service which the railways could perform for general prosperity would be the development of economical transportation of heavy freight. Officers of these railways naturally might learn much from a study of American methods.

But the American railroad problem is changing. In certain populous industrial centers it is coming more and more to resemble that of England or, to a lesser degree, Germany, with the emphasis on passenger traffic and manufactured goods rather than bulk freight. The time has come when, in certain sections, methods of railroading designed primarily for heavy freight traffic and single-track operation must be, and indeed are being, modified. American railroad men can, therefore, learn something in foreign countries as well as teach.

Indeed at no time in the history of railroading have there been as strong reasons why railroad men the world over should keep in close touch with each other with the view of improving operating methods. Strong forces for bringing about international interchange of technical improvements have always existed. News of such improvements moves with great celerity across oceans and international boundaries—largely because they are, in the main, patentable; and patentees and manufacturers of patented improvements are not slow to introduce these improvements into other lands.

Improved operating methods, on the other hand, are not patentable. Not every man who introduces a money-saving *method* in this field shouts his achievement from the house-tops, as he might if it were a salable product. Quite the contrary, in fact, in a good many instances. Knowledge of improved methods travels much more slowly, therefore, than knowledge of improved devices.

All of which leads us to the conclusion that an institution existing for the purpose of keeping railway men of the world in closer touch with each other deserves the support of all enterprising railroad men. This is exactly what the International Railway Congress is.

## A "Program of Peace" Which Is a Declaration of War

CERTAIN moves that have been made recently by the leaders of the railway labor unions are highly interesting and significant to those who have closely followed the manœvering of these men in the past.

With the exception of the principal officers of the Brotherhood of Railroad Trainmen, they participated in and were the prime movers, brains and financiers of the La Follette third party movement last year. At a recent conference in Chicago they definitely declined to participate further in the third party movement. Almost simultaneously they published in their official organ "Labor" a five column statement bitterly attacking the railway executives for the defeat of the Howell-Barkley bill. They charged that the opposition to this bill was part of a campaign to "make a farce of collective bargaining" and to destroy the labor unions. They concluded with the declaration that the labor unions "have a common program of peace, but if the railroad presidents are determined to make war upon them, day in and day out, these organizations will seek a common program of defense."

The entire statement is plainly a smoke-screen thrown up to conceal from the public what the labor unions are trying to do. All signs indicate that they have begun another general wage movement, and that having failed to secure abolition of the Railroad Labor Board they intend to try to evade having their controversies with the railways passed upon by the board and to create in advance a public sentiment that will acquiesce in this policy. The refusal of Congress to pass the Howell-Barkley bill and the results of the last election show that an overwhelming majority of the people of the United States favor the continued maintenance of the Labor Board to determine disputes between the railways and their employees. It will be interesting to see what progress the labor leaders make in their efforts to defeat or circumvent the popular will as thus expressed.

The labor leaders try in their statement not only to put the railway executives in a false position before the public, but, first, to put themselves in a more favorable position. They know their initiation of the Plumb plan and their combination with the Socialists in the last political campaign in the advocacy of government ownership have discredited them in the eyes of the public. They know the campaign of misrepresentation of private management they have carried on for years has been correctly interpreted as merely one of the means adopted to break down private management. Therefore, in an effort to placate public sentiment they say: "The railway labor organizations have no program of attack upon the railroads \* \* \* They are not trying to bring about government ownership. They are not seeking to control the operation of the railroads." When did a great majority of the union leaders cease to advocate the Plumb plan? They were trying up to election day, 1924, to bring about government ownership. When did they quit? In the very issue of "Labor" in which the statement quoted was published there was an editorial entitled "Public Ownership in South Africa" which was intended as a boost for government ownership.

The best answer to their assertion that they "have no program of attack upon the railroads" is the very statement in which this assertion is made. It denounces railway executives for declining to confer with the leaders of the national unions regarding revision of the labor provisions of the Transportation Act. It refers to the Howell-Barkley bill as "re-establishing a machinery of

conference, governmental mediation and arbitration such as had worked successfully for many years prior to the passage of the Cummins-Esch law." It charges that while the Howell-Barkley bill was under consideration "the railway presidents were engaged in fighting the labor organizations wherever they dared and in establishing company controlled labor associations."

What are the facts? The railway executives some years before the war conferred and agreed with the leaders of the train service brotherhoods upon the provisions of the Newlands mediation, conciliation and arbitration law. These same brotherhood leaders in the "basic eight hour day controversy" in 1916 repudiated this law and absolutely refused to arbitrate under it. The result was the passage of the Adamson Act under the threat of a nation-wide strike. To assert, in view of this experience, that the law "worked successfully" is a flagrant and deliberate misrepresentation. The labor leaders themselves stopped its successful working. After that experience with what reason could the railway presidents have believed that the labor leaders would in future permit the successful working of legislation upon which they and the railway presidents might agree?

The shop crafts unions in 1922 refused to accept a wage decision made by the Labor Board and ordered a nation-wide strike. A large majority of the railways have never settled that strike and now have no relations with the national shop crafts unions. The effort to bring about a conference between the railway presidents and the leaders of the national labor unions was an obvious attempt to re-open direct negotiations between the national shop crafts unions and the railways that did not settle the strike. The same purpose was manifest in the Howell-Barkley bill, which would have created a national board of adjustment upon which only employees belonging to the national shop craft unions would have been represented. Most of the railway presidents were naturally loath to enter a conference on the subject of national legislation with labor leaders who had repudiated a law which previously had been passed as a result of conference and agreement, with them and with other labor leaders representing unions which struck in 1922, and no longer have any existence on most roads.

As to the so-called "company unions," they are almost solely organizations of shop employees and owe their existence principally to the reckless folly of the leaders of the national shop crafts unions in calling an indefensible strike in 1922 and subsequently for months refusing to settle with any individual road unless all roads would settle. The question of "collective bargaining" is not involved at all. The railways have never ceased to bargain collectively either individually or by groups with their own employees or with the national leaders of certain unions. When the labor leaders charge that the railway presidents are trying to "make a farce of collective bargaining" what they really mean is that the railway presidents have been evading collective bargaining on a national scale. Everybody knows, however, that there may be just as true collective bargaining between a railway and its own employees as between all the railways and all of their employees of particular classes.

The charge that the railways generally are making war upon the labor unions is a complete misrepresentation. If they were doing this they would be advocating abolition of the Railroad Labor Board. It would be futile for them to attempt to destroy the train service brotherhoods. On the other hand, the abolition of the Labor Board would help them to destroy most of the other labor unions if they desired to do so, unless some such measure as the Howell-Barkley bill were passed. The passage of that bill would have made it possible for the train service brotherhoods to nullify all efforts to get them to arbitrate,

and at the same time would have made it necessary for all the railways to deal with all the other national labor unions, including those of the shop crafts.

The statement issued by the labor leaders seems to indicate what their future program of attack upon the railroads is going to be, although they say they have no such program. It denounces Chairman Hooper of the Labor Board upon the ground that he is prejudiced against the labor unions. When the Labor Board assumed jurisdiction of the recent wage dispute between the western railways and the engineers' and firemen's unions, the officers of these unions refused to appear before it and testify. In the resulting proceedings in federal court their counsel alleged that Chairman Hooper "was so prejudiced against them that he was disqualified from sitting as a neutral arbitrator." The attorneys for the government replied, "He is not supposed to be any more 'neutral' than are the members of the labor and management groups." Of course, what they meant was that the members of the public group are supposed to be, not *neutral*, but *impartial*. Nevertheless, the labor leaders in their statement make the following astounding assertion: "The government lawyers claim that the so-called 'public' members of the Labor Board are in fact expected to be political partisans and if their political opinions are antagonistic to the labor organizations, they are entitled to write those opinions into their decisions."

This statement as to what "the government lawyers claim" is, of course, wholly false. Furthermore, the Labor Board has three public members. Therefore, regardless of Chairman Hooper's views, the other two have the balance of power and by voting with the labor members can at any time cause a decision favorable to the labor unions to be rendered. These assertions regarding "political partisans" are manifestly made as a basis for asking the following question which appears in the next sentence of their statement: "Is there any sensible reason why railway employees should submit their disputes to a board whereon a majority of the members are either management representatives or partisan supporters of anti-labor union policies?"

There is no foundation whatever for the implication conveyed of anti-union partisanship on the part of a majority of the members of the Labor Board. Its real purpose is plain. The engineers' and firemen's unions refused to submit their dispute with the western railways to the Labor Board and by taking a strike vote on the Southern Pacific, succeeded in getting a settlement not in accordance with an award of the Labor Board. The statement issued by the labor leaders indicates that they intend to try to follow the same policy in other instances and shows that their attack upon the Labor Board for alleged partisanship and their attack upon the railway presidents for alleged "fighting the labor organizations wherever they dared" constitute an attempt to so discredit the Labor Board and the railway presidents as to create a public sentiment which will uphold them in attacking the railways and refusing to appear before the Labor Board.

Their so-called "common program of peace" is a declaration of war. Their campaigns for the Howell-Barkley bill and government ownership having come to grief, they are resorting to other methods to accomplish the same results. As pointed out in an editorial in the *Railway Age* of February 14, the average annual earnings of railway employees are now about 112 per cent more than in 1913 and their average working days two hours shorter, while the cost of living is only about 70 per cent higher. Do railway employees believe, that in view of such facts, they will be justified in supporting the leaders of the unions in wage controversies in which they attempt to evade presenting the issues upon their merits to the



Railroad Labor Board, the existence and functioning of which the public has plainly indicated it desires continued? However disgruntled labor leaders may be, the present relations between railway employees themselves and the railways are better than they have been at any time in years. Do railway employees believe they will be justified in supporting the disgruntled leaders of the unions in running amuck, as their statement indicates they intend to do, and thereby disrupting the good relations between the railways and employees that now exist?

Most of the present railway labor leaders have succeeded in completely discrediting themselves in the eyes of the public by their advocacy of the Plumb plan, by their mendacious propaganda against private management and the Transportation Act, and by their recent combination with the Socialists in support of La Follette upon a government ownership platform. The public knows that present wages are mainly responsible for present rates, and that a general advance in wages would indefinitely postpone the time when any reduction of rates could be made, and probably would indefinitely postpone the time when the railways could earn the net return that the public interest requires they shall earn. It remains to be seen whether the public will take more kindly to the new program of these discredited labor leaders than it has taken to the radical and destructive economic and political programs which they have sponsored in the past and which are still fresh in the public mind.

## Cab Signals and Train Control

ONE of the adjuncts of train control that has not as yet been thoroughly appreciated in this country is the audible or visual cab signal, which indicates in the cab the position of the wayside signals. It has been demonstrated in the operation of some of the permanent and interim train control installations already made that the cab signal has proved helpful in maintaining fast passenger schedules, especially in foggy or stormy weather when the range of vision is short, for without such indications in the cab frequent reductions of speed are required to insure safety. A train control system that provides a flash of light or preferably an audible whistle when passing a clear signal assists in keeping the engine-man informed of his location and gives him assurance that everything is clear.

In this connection it is interesting to consider the progress being made in the equipping of the French railroads with cab signaling. Train control as affecting the automatic application of the brakes is not used in France but the indications of the signals are repeated audibly in the cab, the system being used principally in connection with mechanically-operated distant signals, most of which are located closer to the home signal than in the American practice. For example, on the Orleans Railway 223 locomotives were equipped with cab signals in 1924, bringing the total number of locomotives so equipped on that road up to 847. The system is the ramp type, "crocodiles" (ramps) being installed at approximately 1,000 distant signals on this road. Including the three other principal systems of France, reports indicate a total of approximately 7,500 locomotives equipped for cab signaling as compared to only 4,000 locomotives which will be involved in the first order of the Interstate Commerce Commission on 45 roads. After many years of tests and development the French roads believe that an audible cab signal giving an indication when passing a signal at clear as well as when at stop, is desirable.

In complying with the orders of the Interstate Commerce Commission the roads of the United States may

well profit by the example of the French roads and secure maximum benefit from the cab signaling functioning for all signal locations as an adjunct to the required train control, which functions to stop a train only at very infrequent intervals.

## Maintenance-of-Way Costs

THE use of labor saving equipment in maintenance of way work is still in its infancy. Nevertheless, some devices have long since passed the experimental stage and are now standard appliances on many railroads, because studies of the performance of these machines have demonstrated that their use is productive of definite savings. The conduct of all maintenance of way work is being subjected to much closer study than in years gone by. Appropriations are determined and expenditures are controlled by more scientific and businesslike methods than were in vogue a decade or two ago. Greater attention is being given to general or system supervision of the work. Yet in spite of this improvement it is seriously to be questioned whether general maintenance of way officers are obtaining all of the facts that should be at hand for a thorough knowledge of the results obtained through the use of improved equipment and methods.

The reasons for the lack of complete facts are obvious. The investigator of maintenance of way performances or costs is beset with so many variables, such as increases in the volume of traffic, improvements in the track structure, changes in wage rates for labor and improvements in practice that it is difficult to single out any one influence for improvement and show just what advantage has accrued from its introduction. Moreover, as has often been shown, railroad accounting has not been developed along lines that facilitate cost finding.

But to state the difficulties does not condone the failure to make more progress along this line. The problems of maintenance of way will become more involved as time goes on. The responsibility placed on the officers in charge will become more exacting, the volume of expenditures will increase, while, if we are to judge by present tendencies, the development of labor saving devices will tend towards larger, more involved and more expensive equipment than that now in use. This means that the railroads will be compelled to consider more closely than they do now the appropriations for routine maintenance of way expenditures, while their authorization of investments in equipment and tools designed to reduce the outlay for labor will have to be predicated on more accurate records of the savings to be effected, as demonstrated by the results obtained with equipment already in use.

But the problem is not alone one of the demonstration of the advantages to accrue from equipment to be purchased. It involves in even greater measure a burden of responsibility on the officer whose forces are in possession of a large complement of expensive equipment. In the past the railway's plant investment for maintenance of way work consisted simply of the contents of the section foremen's tool houses. Today it includes ditchers, spreaders, power tampers, dump cars, etc., and with passing years this plant will be amplified by additions in kind and much other equipment still to be developed. It is not enough that the investment in such equipment be justified by estimates of its usefulness at the time it is purchased. Maintenance of way records must be so kept as to afford a check on the performance of the various units of the plant to insure that they are all paying dividends. This is one of the most important responsibilities of maintenance of way officers today.

## Articles in the February Railway Mechanical Engineer

*Discussion of Locomotive Steels*, by Lawford H. Fry. Heavy modern power requires a better grade of steel for which proper heat treatment is essential when repairing parts. Abstract of a paper presented before the New York Chapter of the American Society for Steel Treating. Page 88.

*Renovating Interior Trimmings of Passenger Cars*, Part II. An article describing the methods used in renovating metal passenger car trimmings, including silver plating, at the Billerica shops of the Boston & Maine. Page 100.

*The Heat Treatment of Spring Steel*, by J. E. Burns, Jr., member, research staff, E. F. Houghton & Co. A discussion of the effects of temperature and quenching media on the structure of spring steel. Page 111.

*The "Horatio Allen," a High Pressure Locomotive*. A description of the new Consolidation type locomotive recently placed in operation by the Delaware & Hudson. Includes elevation and detail drawings descriptive of the important mechanical details entering into its design. Page 78.

## Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

### Books and Pamphlets

*Annual Report of Port of New York Authority*. Principally on railroads and terminals at New York City. 53 p. maps, diagrs. Pub. by J. B. Lyon Co., Albany, New York.

*A Compendium of Reports and Studies Relating to the Commerce and Industries of Boston*, compiled by Wm. A. Leahy under the direction of the City Planning Board, Boston, Mass. See p. 351 for index of railroad topics included. 357 p. Pub. by Printing Dept., City of Boston, Mass.

*Mutual Interest in the Solution of the Railroad Problem*, by W. W. Atterbury. Address before Industrial Club, Chicago. 11 p. Available from Pennsylvania Railroad Co., Philadelphia, Penna.

*Niagara Falls: Its Power Possibilities and Preservation*, by Samuel S. Wyer. Publication No. 2820, Smithsonian Institution. 28 p. Pub. by Smithsonian Institution, Washington, D. C.

### Periodical Articles

*America's One-Tramp Railroad Train*. A train with which its crew did "general hauling" wherever it could find trackage, during and after the Civil War on southern railroads. *Nation's Business*, Feb., 1925, p. 41.

*History of Great Northern Railway Company*. Sixth of a series of histories of American railroads. *Shipper & Carrier*, Feb., 1925, cover and p. 4-10, 61.

*The A. H. Smith Memorial Bridge and Castleton Cut-Off*, by A. W. Davis. *Trade and Transportation Bulletin*, February, 1925, p. 1-3.

*One Hundred Years of Railway Travel—A Notable Centenary, 1825-1925*. Historical sketch of British railroads. *Sphere* [London], January 24, 1925, p. 104-105.

*Operation of Railroads in Wartime*, by Charles R. Pettis. An historical survey. *Military Engineer*, January-February, 1924, p. 16-19.

## Letters to the Editor

### Getting Ready for a Visit

SOMEWHERE ON A U. S. RAILROAD.

TO THE EDITOR:

I wear overalls and read your magazine whenever I can get it.

I work on a large system which has a large staff of officials. Big ones, I mean, who only come around about three times a year and whose coming is always heralded by much hustling and bustling putting everything in shipshape for them to see. When they come, they usually walk through (the shops) in about fifteen to thirty minutes and are gone. From that time on, no attention is given to cleaning up and keeping up a neat appearance around the premises until the local officers hear of another impending official visit, when all the aforesaid hustle and bustle is repeated to have everything pretty for some fellow to walk by and not notice, or to see and be made to believe it is the normal state. I'm no grouch. The men who hold these official positions do so because they have what I haven't—ability and brains—and I draw my pay check regularly, which is what I work for. But the question I would like to put to high railroad officials is: Are you aware of these spasmodic fits of cleaning up a large shop and terminal two or three times a year to impress you and neglecting it the rest of the time? Do you approve of it?

A WORKER WHO THINKS.

### Grade Crossings in England

CHICAGO.

TO THE EDITOR:

After reading your editorial entitled, "A Near Wreck at a Protected Crossing" in the *Railway Age* of November 29, it occurred to me to send you a photograph of a



crossing gate that is generally used at the few grade crossings in England. In this photograph you will note that the normal position of the gates is across the track so that automobiles may cross without any signal when the gates are open. The railway signals are interlocked with the gates which must first be closed before the signals can be declared. The man operating the signals also handles the gates, his cabin being shown at the left of the photograph.

H. T. BENTLEY,

General Superintendent Motive Power and Machinery, C. & N. W.



# Ford Railroad Has Unique Operating Practices

*Transportation principles same as on other roads—Innovations in administration prove worth*

**W**HEN Henry Ford assumed active control of the Detroit, Toledo & Ironton railroad, in March, 1921, he entered the field of railroad operation, a new one to him, with a point of view entirely different from that held by many railroad executives. He paid \$5,000,000 for the property, not particularly because he wanted to enter railroading, but, as he is reported to have said, because certain property of the D., T. & I. stood in the way of the development of his motor plants. Then, not content to allow the D., T. & I. to remain the run-down property that it was, he turned his attention to building it up so that it would be able to render efficient service in the true meaning of the term.

To manage the new property, he did not summon the previous officers of the D., T. & I., or other railroad officers, but rather picked men from his own organization. These men have also approached railroading with a new viewpoint. They are specialists in organization, and have not been bound by precedent but, on the contrary, have



*D. T. & I. Locomotives Have Nickered Fittings*

a number of departures from ordinary practice, although there is nothing that might be considered revolutionary, as Mr. Ford and his associates have of necessity followed the standard operating methods in general. Many worth-while and copyable innovations are to be seen which may be grouped under these broad principles: (1) to operate with the simplest possible administration; (2) to pay wages commensurate with the character of service rendered and sufficiently high to attract desirable men; (3) to insure that every employee is surrounded by a wholesome environment; (4) to maintain neatness and orderliness; (5) to keep every man busy; (6) to avoid waste of every form; (7) to instill safety into every operation. By the application of these principles, the physical condition of the D., T. & I. has been and is being



*The Typically Clean and Neat Ticket Office at Ironton, Ohio*

been free to exercise theories and practices which have proved successful in the Ford Motor Company.

A new departure in railroading was expected and the results have been closely observed by the railroad world, with the possibility in mind that men working on the railroad problem from a new angle might secure results of far-reaching significance. To determine what results had been attained, two members of the editorial staff of the *Railway Age* have gone over a large part of the D., T. & I. to study prevailing practices at close range.

To outward appearances, the Detroit, Toledo & Ironton is not unlike most of the other railroads of the United States, but there have been introduced on the D., T. & I.



*The D. T. & I. Identifies Its Crossing Viaducts*

improved considerably; its employees are diligent and contented and its patrons are apparently well pleased.

## **A General View of the D., T. & I.**

The Detroit, Toledo & Ironton has a total mileage of 468 miles. Its main line extends from Detroit southward to Ironton, O., a distance of 379 miles. A small portion of this is over line that is rented. Branch lines extend from Dundee, Mich., to Toledo, Ohio, 22 miles; Sedalia, Ohio, to Kingman, 31 miles; Jackson, Ohio, to Cornelia,

18 miles; and Lisman, Ohio, to Bartles, 2 miles. The Detroit & Ironton Railroad, a subsidiary, has laid double tracks from a Detroit connection to Flat Rock, Mich., 14 miles. This line is the model to be followed in construction of roadbed in the future, and will soon be electrified. The road has nearly completed installation of a modern telegraph and telephone circuit, to be used in addition to its present radio facilities. Physically, the position of the D., T. & I. is unfortunate, since its grades are heavy to a large extent, the curves numerous and the cities local to it do not originate a very large volume of traffic. Springfield, Ironton and Lima are the only industrial centers of note besides Detroit on the D., T. & I. It is interesting to note that 60 per cent of Springfield's industries are located on the D., T. & I. In another respect, however, the D., T. & I. is fortunate: it crosses nearly all of the larger east and west trunk lines between Detroit and the Ohio river.

The new administration was faced with the necessity of thoroughly rehabilitating the plant. The program as outlined called for maintenance at a high standard and the acquisition of such facilities as would speed up operations.

The work of ballasting the entire line was begun; 90-lb. rail replaced that of much lighter section. Since approximately 80 per cent of the D., T. & I. business is handled north of Springfield, the first improvements were made on that portion of the line.

A number of cut-offs are contemplated to reduce distance and eliminate heavy grades and curves. One of these, connecting Durban, Mich., and Malinta, O., 56 miles long, double tracked, will have only slight grades and two easy curves. This will shorten the present route by 20½ miles and cut more than two hours from the present running time of freight trains. At one end of the Detroit & Ironton cut-off, near Flat Rock, a 3,700-car yard is under construction, with extensive engine and car shops. Among other things, this yard will serve to help relieve the rather limited yard facilities in Detroit.

From 2,700 to 3,400 cars, empty and loaded, are handled on the D., T. & I. daily, including about 1,200 loaded cars out of Detroit. Slightly more than half of this is freight of the Ford Motor Company, including cars and parts and coal and raw materials.

#### Administration Is Kept Simple

Titles, except those required by law, were abolished in reorganizing the D., T. & I. administrative department. The plan was to build a flexible organization, one which would develop the officers' individual initiatives and, more important, abolish red tape. Consequently, there are fewer officers than might be expected on a road of the size of the D., T. & I. Several departments have been abolished or reduced to mere skeletons. Otherwise, the officers and present administration are not unlike those on most roads.

The executive officers are: Mr. Ford, president, and E. G. Liebold, vice-president in charge of operation, both of whom fill their positions by reason of their general supervision over all Ford Motor Company operations. F. L. Rockelman is vice-president and general manager. G. R. Brubaker is secretary and treasurer.

The road is divided into two divisions, the Northern and Southern, each under a dispatcher. The Northern division employs two trainmasters and the Southern division, one. There is one roadmaster, who is the ranking maintenance officer. Local supervisory officers have duties similar to those of corresponding officers on other roads, with different titles in some cases. Only one clerk is employed in the maintenance department. Such work as may involve engineering of considerable magnitude

is handled by a staff under the officer in charge of engineering for the Ford Motor Company.

Mr. Brubaker, secretary and treasurer, receives the reports of the accounting and claims departments, which in turn deal with the forces along the line. The accounting department, with a small staff comprising 80 persons, does the work formerly spread out along the entire line. This was accomplished by extensively simplifying and systematizing the former methods of bookkeeping and making reports. Now the station agents prepare only three different statements for the accounting department, namely: (1) statement of cash collected; (2) report of tickets sold, and (3) draft statement, if any drafts are issued. All bookkeeping formerly done at the stations has been taken over by the general accounting office. Formerly it was necessary for station agents to prepare abstracts of waybills received. Now the waybill is forwarded to the general office where it is entered by machine in the station ledger, and simultaneously the same entry is made on the abstract used to divide and settle charges between railroads. Any increase in the personnel of the general office has been more than offset by the decrease at the stations, not to mention the fact that the station employees are now much freer to devote more time to other duties, such as freight solicitation. Further to expedite this system, all of the stations have been equipped with standard file cases, so designed that the correspondence files and the tariff files will correspond in all the stations. Not only does this facilitate the work of the traveling auditors but also the work of agents who may be transferred from one point to another. All station records are prepared in three filing sizes, namely: standard interchange size, waybill size and freight bill size.

The legal department of the D., T. & I. is of slight proportions, and shows a monthly expense account of about \$200 for handling legal matters. The traffic and commercial departments have a personnel which, if combined, would number 25 persons. The commercial department has charge of assisting new industries to locate on the D., T. & I. Local freight agents at Springfield, Ironton and Lima act as district freight agents.

#### Methods and Facilities Highly Standardized

Shop practice is standardized in every possible way. Locomotive and car parts have been divided into a few classes and repair work standardized for each class. Patterns have been made of these standard parts and stock parts manufactured and distributed to shops where they are stored in standardized stock rooms. More than 10,000 blue prints of such parts have been prepared and filed. The stock rooms at all shops store these parts in identical compartments, thus permitting an index system to be evolved. Running repairs are made at Jackson under an officer of the mechanical department, while heavy repairs are made at the locomotive erecting shops at the Ford River Rouge plant. A foreman of engines supervises the motive power. Roundhouses are located at South Yards (near Detroit city limits), Napoleon, Lima, Springfield, Jackson and Ironton. The yard now being built at Flat Rock will include a roundhouse.

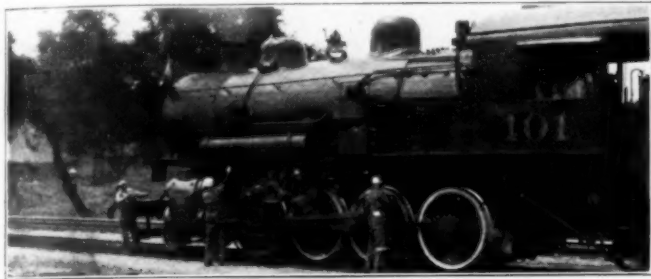
#### Road Pays High Wages

The wages paid D., T. & I. employees are considerably higher than those paid for corresponding positions on other roads. The essential consideration, however, is that Ford wages go only with Ford methods.

Customarily, the wage for beginners is \$5 a day, which is increased automatically to \$6 after 60 days. The general practice of the company is to pay employees in proportion to the quantity and quality of their service.



Theoretically there is no maximum rate of pay for an employee, but in practice maximum and minimum rates prevail for each class of service. Typical of wages now effective are the following: engineers and conductors, \$300 to \$375 a month; firemen, \$200 to \$275 a month; flagmen, \$6 a day to \$250 a month; machinists, \$6 to \$8 a day; maintenance of way laborers, \$6 a day. Thus the wages of engineers are ordinarily increased by \$25 increments as they qualify for recognition, the most important considerations being ability to run trains according to schedule, freedom from accidents, a good discipline



While Trains Are Waiting, Crews Polish Bright Work on Locomotives

record and interest in the care of the locomotive in his charge.

The employees are not on piece work but are paid by the hour. They are expected to do their best, at least not to fall below a certain standard. Recommendations of foremen or immediate supervisory officers are the chief considerations in fixing the employees' rates within the allowable range.

The practice of attempting to pay each man what his services are worth naturally leads to different rates for men working side by side in the same group or gang. No attempt is made to limit the number of men receiving the higher rates in a gang; all are encouraged to strive for the maximum. It is felt that a man earning the higher rate is more economical as he will be more efficient in the use of time and material. The differential between the wages of foremen and their men is relatively small. No apprenticeship system exists on the D., T. & I.

Employees in other than train service are on duty eight hours a day during the week, with a general shut-down on Sunday. The only employees at work at all on Sunday are those engine hostlers who may be required to report for duty late Sunday evening to prepare engines for early departure Monday morning, or to care for locomotives which tie up late Saturday evening. Trains are not sent out of terminals on Saturdays unless there is sufficient time under normal conditions for them to reach their destinations before midnight. The entire property is idle on Sunday, the stations being closed and even the crossing watchmen off duty.

#### No Overtime Is Paid—or Worked

In accordance with Mr. Ford's doctrine that a man properly directed can produce enough in eight hours to support himself adequately, the eight-hour day on the D., T. & I. is an actual one and not merely a basis of pay. No overtime is paid because employees are not permitted to exceed the limit of 208 hours of work in any one month. In cases where employees must do overtime work, this extra time is absorbed in the future by the employees laying off. While it might seem at first that the effect of this plan would be to penalize men who perform their work quickly, they are compensated by the fact that the quality and quantity of their service is considered in fixing the rate of their wages. The attitude of the man-

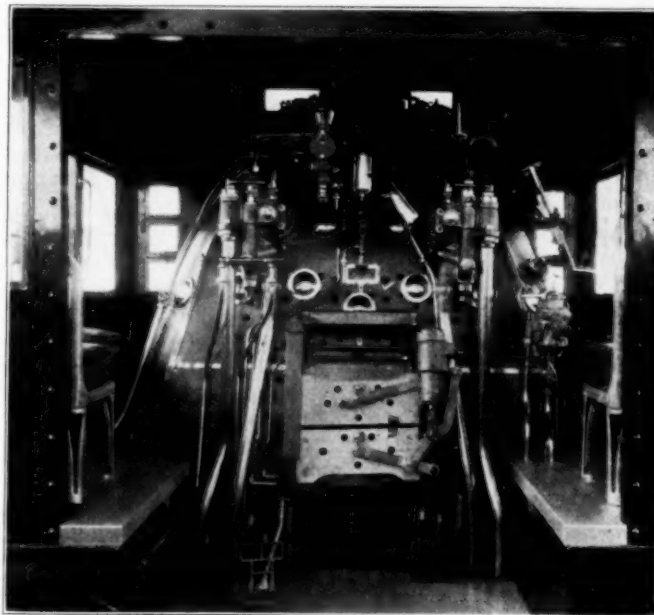
agement is that when punitive overtime is paid, there is no incentive to men to complete their tasks within the regulation eight hours. It has been the experience of the D., T. & I. that the payment of a high wage for a day's work of eight hours speeds up operations in every department.

The payment of such wages, the management concludes, completes all obligations of the employers. Officers and employees of the D., T. & I. are therefore not permitted to accept transportation from other carriers, although transportation over the D., T. & I. is granted to other railroad employees in accordance with the prevailing custom. The few annual passes over the D., T. & I. which are held by its officers are used only on business. No passes are provided for members of employees' families, and if the employees or officers themselves take pleasure trips they must pay their fares.

Neither are old age pensions paid, the attitude of the management being that pensions are merely the deferred payment of wages earned by employees during their years of active service, and that the men should be paid an adequate wage while they are working so that they will be able to take care of themselves when they are no longer able to remain in railroad service.

#### Deal Directly With the Men

The D., T. & I. does not treat with the brotherhoods, and asks that the employees submit their grievances directly to the management. Special efforts are made to maintain as uniform a force as possible throughout the year although some variations do occur because of traffic



Aluminum Floors, Deep-Cushioned Seats and Nickered Fittings Distinguish Engine Cabs

and climatic conditions. During the months of retrenchment, the work available is divided among the men so that none will be without employment. When traffic volume decreases the number of hours worked per month by each employee in train service is scaled down proportionately. Thus, during the depression last spring the maximum number of hours a man could work was reduced from 208 to 176 hours, for example. This enabled the management to avert laying off some of its men, kept the force intact and assured them sufficient income to at least meet their necessary expenses.

Similarly, no desirable men in the maintenance of way department are laid off during the winter. The D., T.

& I. has found this a convenient opportunity to weed out the undesirable and inefficient men, but the efficient employees are kept at work at least part time. To illustrate, last winter when the section crews were reduced from a standard of six to four men, the work was divided among the six so that each worked four days a week and received an income for this labor, and the gang organization was kept intact every day. Consequently, when spring came, the entire force was available. This practice of keeping efficient men tied up with the company has also been found useful in emergencies where large forces are suddenly in demand.

During summer no extra gangs are employed in maintenance work. Rather the practice is to make each section foreman responsible for all work on his section and when heavy work such as relaying rail or ballasting is necessary, extra men are assigned to his gang, sometimes as many as 20 or 30 at a time. When the need for these extra men on one section has passed they are transferred to another section. Where heavy ballasting or other heavy work must be done, several section crews may be concentrated on one job.

### Men Are Kept Busy

The D., T. & I. management believes that in justice to the employees themselves they should be provided with enough work to keep them busy, and it demands the best in them all the time they are on duty. This is done not only to secure a full return for the wages paid, but also to keep the men from falling into poor habits. It is believed that a man in a rut cannot do his best work either for himself or his employer. This practice, of course, reduces the number of employees necessary to the operation of the road and at the same time keeps them in constant action, thus increasing their efficiency and output.

This plan has been carried out without regard to departmental lines and a large number of interesting instances of the operation of the plan are noticeable. For instance, car inspectors at certain points are carried on the section foreman's rolls and are required to work on the track during spare time. At other points car inspectors assist the car repair men. During the recent lull in business a number of cabooses were released from service and set out at these points where they were repaired and repainted in spare time by these car inspectors. Car repair men operate pumps at several stations. Station agents keep their buildings in order and make certain necessary repairs with materials furnished by the stores department. In many instances they paint the station buildings. The traveling auditors are inspectors of all operations on the road and report on the ability of agents and other conditions. Every employee is an inspector of some sort, the trainmen, for example, making monthly reports on safety conditions along the line and at grade-crossings. All employees are also active traffic solicitors, this being obligatory rather than optional as on many roads. There are countless other examples of the ingenuity of the management and employees in providing constructive work for all time employed.

Employees who are disinclined to follow the management in this arrangement are disciplined or discharged. When the D., T. & I. was first taken over by the present owners, there was rebellion against such orders. This trouble is now very largely a matter of the past.

Strict discipline is enforced over the road although as far as practicable this is accomplished by assigning employees to work less pleasant than their regular duties and also less profitable, rather than by taking them out of service. In administering discipline the policy is to refrain as far as possible from discharging a man or

laying him off for any length of time on account of the effect on his family which would thus be deprived of support. It has been found even more effective to provide extra hard work for the man being disciplined so that while his income will not be discontinued, he will still realize that he is being punished. Thus an engineman who violates the company's rules may be assigned to heavy manual labor at the cinder pits or elsewhere. Of course, belligerent employees are permitted to sever their connection with the company. Before a man is discharged because he fails to meet requirements of one department, he is transferred to other work in an effort to locate him where he can make good, if possible.

### Neatness and Orderliness the Rule

There is no more hard and fast rule on the D., T. & I. than that the property must be clean and neat. This applies to employees as well. The management believes that cleanliness is an essential to morale. Makeshift cleanliness will not be tolerated any more than makeshift methods.

Buildings are painted in gray inside and out and all employees make it part of their duties to keep these clean. Even the insides of desk drawers are painted white so that dirt will not be overlooked. In providing employees with equipment which may be readily kept clean, the management has done its share, and therefore has a right to expect the employees, for their own health and self-respect, to be neat and wear clean clothes. Ample locker space is provided in terminal buildings.

The campaign for neatness along the right of way has



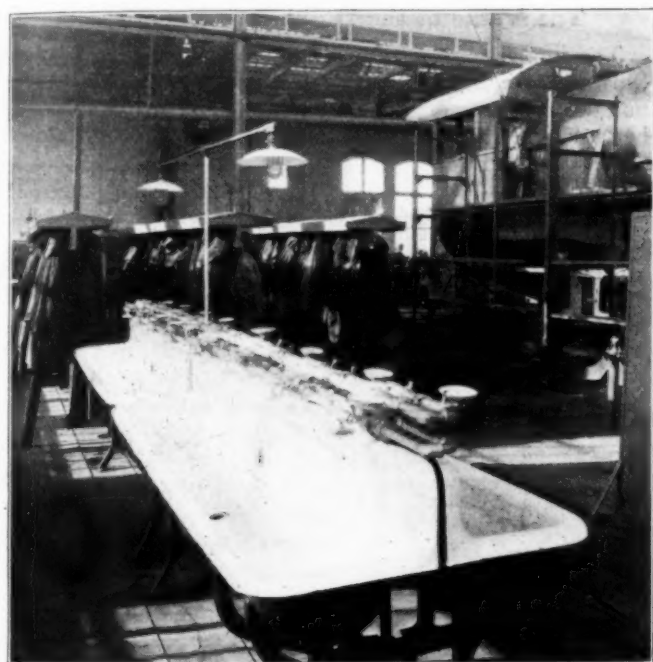
One of the Two Machine Shops at River Rouge, Detroit

been carried to the point that industries located on the D., T. & I. property have been asked to clean up and move back a distance from the right of way. In nearly every instance such action has resulted in the elimination of a side-swipe hazard, and the industries have for the most part been willing to co-operate. The line and property are policed constantly by employees and no refuse is allowed to be dumped on it. Making all employees a real, active part of the clean-up program has given the campaign an added significance to them and has made them prouder of the results. Under expert instruction, the employees have been instructed in practical fire-fight-



ing methods. Incidentally, smoking is not permitted anywhere on D., T. & I. property. This rule applies to officers as well as employees, whether on or off duty. Not only is this conducive to better work, but it lessens the hazard of fire.

In the shops neatness and order are also the rule. In the roundhouses the floors and walls of the engine pits are painted in gray while the walls are white and are frequently washed, sometimes daily. The employees' locker rooms and lockers are kept in good order by provision of receptacles for refuse and enforcement of an order to use them. The storerooms with their standard cages and



Modern Washstands and Clothes Hangers Are Provided in Shops

neatly piled stocks are models of cleanliness. The safety department is constantly alert to improve the safety conditions; its work is reflected in the fact that the number of serious accidents is constantly decreasing.

Locomotives on the D., T. & I. are an especial pride. All pipes and fittings are nickel and are kept highly polished. The locomotive cabs are very roomy, made of thick steel, and have large plate glass windows. Among the special features of these engines are the aluminum cab floors, which absorb a certain amount of cold besides making for better appearance; aluminum chairs with thick spring seats; numerous fixed electric lights and extensions, including bulbs under the side running boards to aid enginemen to oil and make night repairs. More than 75 per cent of the D., T. & I. motive power has been thoroughly rehabilitated at the D., T. & I. erecting shops.

When trains on the road are delayed for any reason, all members of the crew, excepting those protecting the train, are required to busy themselves cleaning and polishing the fine work on the locomotive. This is done not only to improve the appearance of the engine, but to remove dirt and thus expose defects and increase efficiency. Fewer repairs are necessary when the locomotives are kept free from dirt and rust. No sledges or other heavy tools are allowed in the standard locomotive tool boxes, as it is deemed that these would do considerable damage in the hands of a careless or unskilled employee. The unusual quality of the D., T. & I. locomotives has given the majority of enginemen a high sense of pride in the

motive power, which, of course, is essential to such a maintenance program.

Before they are allowed to begin their service, newly employed engineers and firemen often spend a week or more in the shops where they do a variety of special work. For example, at the Rouge locomotive erecting shops, newly employed engineers, firemen and certain machinists spend a certain length of time in a department where they buff driving rods and main rods with hand files. This painstaking process teaches these men truly to appreciate just what amount of hard effort enters into a piece of fine mechanical craftsmanship. It impresses upon the men the great value of such mechanical parts, and, furthermore, sharpens their eye in the ready detection of flaws, no matter how small. After this course of training, the men are not nearly as likely to be careless with expensive equipment as they might otherwise have been.

The management believes that this policy of keeping the engines in a prime state of cleanliness has produced a reduction in the number of engine failures. Trains are being hauled with fewer delays and the motive power requires less repairing. A 15 minute delay because of engine trouble constitutes an engine failure on freight trains, as does a 10 minute passenger train delay.

### Waste Is Avoided

At every point Mr. Ford and his associates have endeavored to eliminate waste, which they believe constitutes a very large item of railway expense. This has been directed not only at the handling of materials on the D., T. & I., but at the disposition of employees' time, as is evidenced by the efforts made to keep all employees constantly busy at something. The road works on the principle that nothing should be thrown away. Materials which have worn out frequently may be put to good use elsewhere, as in the case of old telegraph poles which were cut into shorter lengths and used as fence posts. Old rail was sent to the Ford coal mines. Discarded cross ties were converted into thousands of bushels of charcoal for use in the forges, and so forth.

Slag from the Ford Motor Company's mills is used as ballast, while a cement mill at the same plant produces sufficient cement for use in bridge construction. Good advertising space on the bridges over highways is not wasted, for there is erected the trademark of the D., T. & I., made into attractive green and white metal signs.

The extent to which the company carries its fight against waste is shown in the case of a D., T. & I. bridge across the Huron river at Flat Rock. When the old pile trestle at this point required renewal, the company constructed one of concrete which serves as a power dam as well, and which is wide enough to accommodate a highway in addition to the railroad tracks.

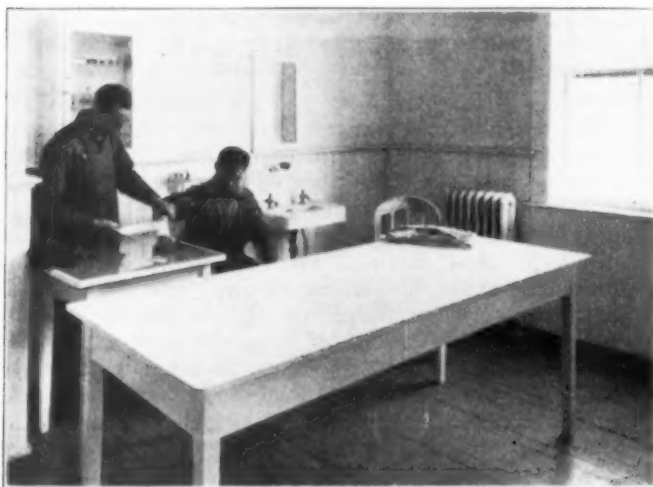
In 1923, the company began publishing its first employees' paper. The D., T. & I. Railroad News, which appears for free distribution twice monthly. It endeavors to create real good-will and convey to its readers information which they properly should have.

### Environment of Men Supervised

The D., T. & I. management regards the higher wages and improved working conditions which prevail on the road as a definite incentive for proper living on the part of the employees. It is believed that to perform his work correctly and satisfactorily, a man must live right. Further, it is believed that there is a possibility of lowering the standard of work by paying increased wages to some employees. On the other hand, it is believed that financial worries harm the quality of work produced by the men. The management feels justified, therefore, in investigating the personal habits and home conditions of employees

when deemed wise. To introduce this helpful advisory policy of seeing that the employees, either through ignorance or wilful neglect, should not endanger themselves or their usefulness, the management upon assuming control, questioned all employees about such matters as the amount of their savings and debts and their personal habits. The policy of keeping tab on the employees' home life for their own welfare as well as for the company's has also resulted in regular inspections of hotels and rooming houses patronized by employees. No cooking or sleeping is permitted in the way cars or cabooses, as it is believed this is not the proper place to secure a good night's rest or a wholesome meal.

Following up the idea that a man who lives beyond his means renders himself less efficient, the management requires its men to conduct their accounts within their incomes under penalty of discharge. In enforcing this rule, 40 employees at one terminal who had bought expensive cars on the installment plan were required to sell them, because the financial obligations were so large that the inevitable result could only have been worry and poor work. D., T. & I. employees, the management thinks, can



A Dirty, Unused Storeroom Was Converted into a Modern First-Aid Station

live on their salaries and will do so and save money if they are shown the folly of extravagance.

To induce its employees to be thrifty, the D., T. & I., slightly more than a year ago, inaugurated a plan by which employees could put a portion of their earnings to work in the company. No rate of interest is guaranteed, but in 1924 the company's financial showing warranted payment of a 14 per cent return to employees holding certificates. These increments cannot be re-deposited and employees may not deposit more than one-third of their regular pay in the savings plan. The employees are not only urged but are expected to purchase the certificates unless there is a sufficient reason for their not doing so. By the beginning of 1925, more than half of the members of the D., T. & I. organization had shown their interest by making deposits, totaling \$278,101.

The D., T. & I. will not allow its employees to be victimized by merchants on account of the fact that these employees may receive higher incomes than their neighbors who are employed by other industries. An example of the manner in which this works is shown in the handling of a problem which arose in Napoleon, O., where a terminal is located. When the higher wages were made effective for D., T. & I. men, merchants established two prices for their goods, the higher one of which applied to D., T. & I. men. This situation was fought by arranging

with a large chain store system to establish a branch in Napoleon. Prices went back to normal.

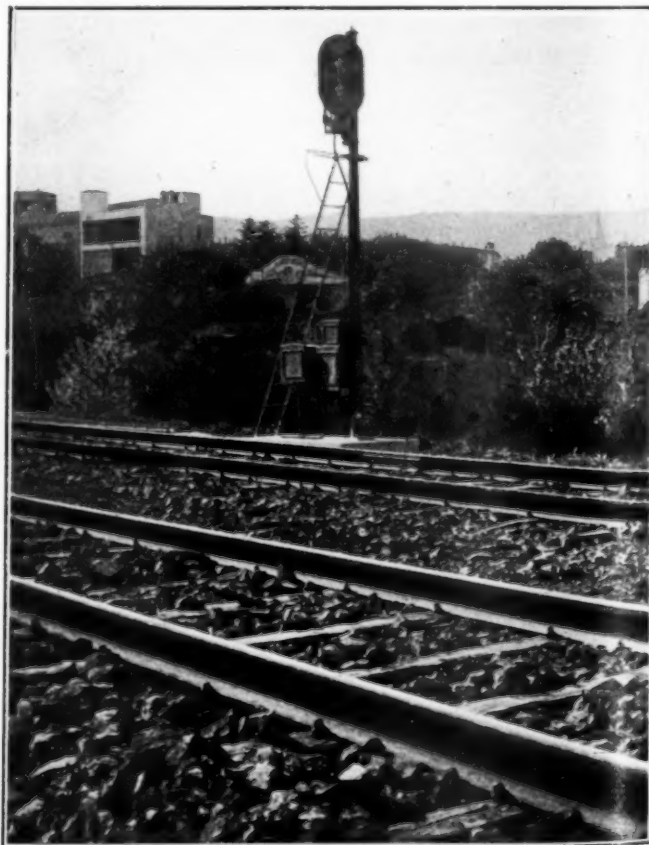
Adequate medical and hospital service for employees is maintained all along the road. Those who are taken sick are provided with medical service and hospital attention at cost. The same service is offered to the employees' families. In cases where the wives of the employees are unable to carry on their duties in a home where there are children, housekeepers are provided to maintain the home intact until the mother recovers. The aim of this plan is to remove from the minds of the employees apprehension over the result of sickness in the family so that they are able to do their best work at all times.

#### The Value of the D., T. & I. Experiments

The innovations introduced by Mr. Ford on the D., T. & I. are of value not merely because they have helped to put the property on a sound basis, but because they may be studied by officers of other roads. Most railroad officers will consider that it is impossible to introduce on their own roads many of the things that have been inaugurated on the D., T. & I.; however, many of these innovations appear adaptable.

The experience of Mr. Ford and his associates in the operation of the D., T. & I. is most valuable to the transportation industry in general and to railway officers in particular in that it shows the effect of handling the railroad problem from a new viewpoint. As in other industries, there is a tendency in railroad operation toward a despotism of precedent. The success of the different methods advanced by the D., T. & I. indicates that many of the old methods may, perhaps, be changed to the advantage of the patrons, the employees and the railroads themselves.

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Color Light Signal on a Spanish Railway



# Analyzing Shop Output and Costs\*

*Suggestions for more definite repair classifications—What bases of cost measurement are practicable?*

By J. E. Slater

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**B**EFORE discussing methods of statistical analysis, one should inquire whether any method of analyzing shop output and costs is, in fact, necessary. A large number undoubtedly will answer in the negative. That same answer has been made by many transportation officers as well, but such a statement is based upon a hope rather than upon a fact.

I have in mind several years ago a study which was made of a particular phase of engine house operation in which a very large amount of overtime was being earned. The mere figures in themselves were so conclusive that the overtime was eliminated immediately the information was in the hands of the officer in question. Although he had observed that operation at that particular point many times before, and though it was under the constant view of his subordinates, it had never occurred to any of them that such a saving was possible.

For the railroads of the United States, the ratio of maintenance of way expenses to operating revenues in 1913 was 13.1 per cent; in 1923, it was 12.9 per cent. In the same period, the ratio of transportation expenses to operating revenues increased from 34.4 to 36.9. On the other hand, the maintenance of equipment ratio increased from 16.1 per cent to 23.4 per cent. These figures in themselves do not signify that there has been an excessive increase in maintenance of equipment expenses. Nevertheless, they put the question squarely to the mechanical officers to justify the startling differences. While there is no doubt that the increase in the size of the locomotive, in the number of appliances and the increase in the intensity of the work are important factors, it is impossible to judge accurately to what extent the greater increase in mechanical expenses is due to these factors. With the scanty amount of information available, it is difficult to tell anything about our maintenance of equipment expenses. Is it not common sense to attempt to analyze these expenses before we condemn entirely the use of statistics in mechanical operations?

Yet we do have some mechanical statistics. Whether he desires it or not, the mechanical officer will be checked by the data available. That data should be informative. Today it is not. Let us then analyze the statistics which are available and determine to what extent they give accurate information and whether it is possible to make such changes that a proper analysis can be made.

## The Weakness of Locomotive Repair Classifications

The statistics of output of our locomotive shops are confined for the most part to the number of engines turned out. The classification of locomotive repairs adopted by the United States Railway Administration has been continued, not apparently because it has any intrinsic merit, but because no better classification has been suggested.

While by this classification it is intended that heavy classes of repairs should mean heavy work for the entire locomotive and lighter classes of repairs should cover light repairs for all parts of the locomotive, as a practical

matter the classification is largely controlled by the boiler and firebox work and the turning of tires. The work on machinery and tender is not controlling. Furthermore, the classifications are so broad that in themselves they give little idea as to the amount of work which has been done. If an engine house turns a set of tires and does the necessary work on the machinery and boiler, it is given credit for a Class 5 repair. If, in a shop, the flues are not installed new or re-set but very heavy repairs are made on the machinery, possibly involving new cylinders, extensive rod work, etc., it receives credit only for a Class 5 repair.

In connection with the Class 3 repair there may be nothing done on the boiler, but the installation of a new set of flues; yet, the same credit is allowed as when a new set of flues is installed and the firebox largely renewed. Every mechanical man can recall numerous cases of Class 5 repairs costing more than Class 3 repairs, and one Class 3 repair costing twice as much as another at the same shop and for the same class of locomotive.

Frequently attempts are made to equate classes of repair to standard units. A Class 1 repair is assumed to have three times the weight of a Class 5 repair, a Class 2, two and one-half times, etc., the total output being expressed in equated Class 5 repairs. I have tried to do this myself and at last have arrived at the conclusion that such a method is not worth the time taken to perform the work. An example of the uselessness of such attempts came to my attention very recently. A statement was prepared analyzing the costs of classified repairs at one of our shops. The classified repairs were equated to Class 5 repairs and a cost per unit obtained for each month of the year. Using the first month as a base, and comparing the results of the other months with it, it was found that the costs for the later months were consistently lower than the costs for the first months. The saving for the eleven months was found to be in the vicinity of \$300,000. The statement was given me to check. We set up another statement using the last six months of 1923 as a base instead of January, 1924. The method of equating was slightly different but based upon the actual differences in the cost of the various classes of repair during the year 1924. This statement indicated that instead of there being a saving of \$300,000, there was a loss of approximately \$350,000. Which of the statements is correct, neither I nor anyone can tell.

In spite of the well recognized fact that the present classification furnishes little information as to the work done, it is universally used and is one of the few statistics which we have today governing our locomotive maintenance program. It is an excellent example of the weakness of our present mechanical statistics, for it provides just enough information to provoke questions, while it answers few of them.

There are two ways by which the statistics of output of locomotive shops can be improved, either one of which is a distinct step in advance of the present method. The first method is that of breaking up the two largest and most important classes, namely, Classes 3 and 5, into sev-

\*Abstract of a paper read before the New England Railroad Club, February 10, 1925.

eral sub-groups in accordance with the character and amount of boiler and machinery work done. A segregation made by one of the New Haven staff contemplates six sub-classes under Classes 3 and four under Class 5. For the Class 3 repair, boiler work is divided into three sub-classes and the machinery into three sub-classes. The heaviest boiler work would involve the renewal of sections of a firebox, such as a half or quarter of a side sheet, door sheet or throat sheet. The medium class of boiler work would involve patching rather than renewals. Under the light boiler work there would be no firebox work.

Under the heavy machinery work there would be involved new cylinders, pistons, guides, valves, crossheads, on valve motion, as well as other heavy work on rods, shoes and wedges, driving boxes, etc. This would be work involved primarily in the superheating of engines formerly using saturated steam. The medium class of repair would include heavy machinery work on locomotives not being super-heated, involving a new cylinder or cylinders re-bored and re-bushed, frames rebolted and work of the same class on shoes and wedges, driving boxes, rods, etc. The light class of repair would involve no new cylinders, but only the necessary work in building up, facing, grinding or aligning cylinders, pistons, valves, guides, crossheads, rods, etc.

In Class 5, the boiler work and the machinery work are each divided into two classes—heavy and light. The heavy boiler work involves patching the firebox, while in the light class of repair, no patching is required, but only the necessary renewal of stay bolts and other work following the test. Under the heavy machinery work there would be new cylinders or cylinders re-bored and faced, together with piston heads built up, rods ground and guides either new or built up. It also involves the overhauling of the valve motion and crossheads babbitted and planed. Under the lighter class of repair, there would be no work on the cylinders and only necessary work on rings, guides, rods, valve motion, etc.

Whether it is necessary to divide Class 3 repairs into six groups and Class 5 into four groups or not, the tremendous range in the average cost of these repairs makes it obvious that some natural sub-divisions can be made. Such sub-divisions would indicate clearly the causes for differences in the cost of making classified repairs and would tend to cut down to a very large extent the differences in the cost per engine. With the additional information as to the character of boiler and machinery work, many questions would be answered on the face of the report. This particular method also has the advantage of using the present classification of locomotive repairs and the information can be developed from the data on the shop report. It is possible if comparisons are desired, to go back and work it up for past periods.

#### The Standard Hour Classification

The second method is that of equating the classified repairs on the basis of standard hours. The standard man-hours would represent the total hours under bonus or piece work schedules necessary for the work. For example, let us suppose that the standard hours of an ordinary or normal Class 3 repair is 4,000. Let us then assume that the standard hours of an actual Class 3 repair is 4,400. The output would be increased not by one Class 3 repair, but by 1.1 Class 3 repairs. Likewise, if the standard hours of an actual job amounted to but 3,600 hours, the output would be increased by only .9 Class 3 repair. In this manner, since the standard hours are an absolute and unchanging measuring stick and are not affected by any difference in the efficiency of the men, there is provided an absolute method of equating the differences in the amount of work done in different loco-

tives. In days gone by, classifications were frequently based upon the amount of money or man-hours actually spent. The objection to this basis, however, is in the fact that the more inefficient the men and supervision of the shop, the heavier the class of repair as shown by the report. When the work is expressed in standard hours, however, there is furnished an equation factor unaffected by the efficiency of the men, changes in wage rates or other like items.

This method, however, is possible of application only where there is some cost time keeping or bonus system, and where the operations are currently tabulated and the standard hours applied to them. Fundamentally, it would be possible to obtain the information where piece work systems are used, but the piece work system in itself does not necessitate the compilation of what the man does coupled with the length of time taken to do it. Under a bonus or a cost time keeping system, such information must be compiled in any event so that it is available for other use without greatly increased clerical work. Such a basis is not susceptible of universal application. The standards would necessarily differ with different shops. This, in itself, however, should not be a determining factor since it is generally recognized that it is impossible to make comparisons between shops on any but the broadest lines, and such comparisons are usually fruitless.

One of the greatest defects in our present accounting system as far as maintenance of equipment expenses are concerned, is in the combination of classified and running repairs in one account. One of the first segregations which any road should make in its Account 308, Locomotive Repairs, is a division between classified and running repairs. These two groups of expenses are controlled by different sets of circumstances. For the most part, one is performed at the shops and the other at engine houses. One is governed largely by the mileage over a period of many months—the other by current mileage. One is primarily on a production basis—the other on an emergency basis. One should be measured by the amount of work put on the engine, while the other can be measured by current locomotive miles or other like units.

The second sub-division should be between types of locomotives. This information is valuable, not only because the cost of maintenance will naturally vary with the weight, size and class of service in which the engine is engaged, but is also valuable to the management in its consideration of future purchases of power. Everyone knows that the maintenance cost per locomotive mile or per 1,000 ton-miles of different types of locomotives of approximately the same tractive force will vary considerably, and it is highly important that the maintenance costs should be on such an accurate basis that the management can take these facts into account when purchasing new engines.

In the division of the repair costs among the classes of locomotives, and particularly when this is carried to a cost for each locomotive repaired, it is of the utmost importance that the assignment should be as complete and accurate as possible. All mechanical men are familiar with the division of expenses that was obtained under the old system in which the men designate the number of hours spent on each engine. On almost every railroad there are classic examples of large amounts being charged to an engine which had not for a long period of time turned a wheel or which had been stored. On the other hand, when an accurate allocation of expenses is desired, there is a great difficulty in assigning all of the expenses or even a large portion to individual engines. If a knowledge of the costs of repairing the individual engines in a shop is of any value whatsoever, it is worth while to have the clerical work in preparing these data made important and not incidental.



In this connection, I believe it will be found that better records will be obtained where the accounting work is done under the jurisdiction of the accounting department by a shop accountant stationed at the shop than when it is done by clerks on the mechanical department payroll. When the accounting is done by the mechanical department employees, adequate supervision is rarely given it since the work is not the fundamental job of the mechanical department. On the other hand, it is the principal task of the accounting department to obtain accurate and complete records. Experienced supervision is provided to see that the records and reports are correct. New methods of doing the work are studied and applied. It has been our experience that with the accounting work done by the accounting department better results are obtained.

I would go further, however, in dividing the cost of locomotive repairs and would so segregate them that I would know the cost of the maintenance or renewals of various parts of the engine. The boiler would be divided as to shell, firebox, tubes and other parts; the machinery as to running gear, valve motion, frames, cylinders, rods, spring rigging, foundation brake rigging, engine and trailer trucks, cabs, boiler fittings, steam pipes, throttles, etc., air brake equipment and miscellaneous; the tender as to cistern, underframe and trucks. In addition, there would be separate costs for the unwheeling and stripping of the engine and the final painting.

With this information, and with further segregations which can be made when desired, it would be possible not only to analyze to a better degree the cost of individual repair jobs but to have available accurate information as to various types of parts. The officers' data are based only on observation and such information as may be derived from checking the issues from the stores department over a period of years. On the New Haven this will not require any appreciable increase in accounting expense, most of the data being available now from the bonus record, the only additional work being in adding several columns instead of one or two.

Here, as in answer to many other questions on mechanical costs, I would say that since we have practically no information now, we can not say that such additional information will not be worth the expense of compiling it. In view of the enormous expenditures for locomotive maintenance, we should make the attempt before we condemn in wholesale fashion any method of analyzing expenses more accurately.

#### Checking Unassigned Expenses

We usually think of costs in our own shops in terms of labor and material, and I fear that very frequently the items of unassigned and shop expense are not analyzed. I question whether it is necessary to make any detailed analyses of these items currently since they will be controlled to a large extent by the amount of production at the shop. Nevertheless, in view of the fact that shop expense will amount to 25 or 30 per cent of the cost of assigned labor and the unassigned expense at some points is very large, we should at least once or twice a year have a complete segregation of these items and an analysis made of them.

In addition to shop expense, there is the question of the use of machinery. Large locomotive shops are filled with expensive machinery and there should be some effort to determine whether the purchase of machinery has been justified. This should be done not as a post mortem examination, but as an aid in the purchase of future machinery and also with a view of re-locating machinery in that or some other shop where it can be used more intensively. At commercial shops where cost accounting systems are employed, overhead is charged for the ma-

chine and the space it occupies on the basis of the time in use. No such system is necessary in a railroad shop, but I see no reason why a time study can not be made periodically to determine the number of times machines are used and the cost in fixed charges per operation.

It has been my observation that we are likely to go to either of two extremes—either we assume that we can make any item of material cheaper than we can buy it, or we assume that we can make nothing as cheaply as we can buy it. The best way of deciding this point accurately is to test out the proposition and take into account the fixed charges per operation on the machines used. This will provide many surprises where there are expensive machines without intensive use of them.

#### Locomotive Performance Related to Repair Costs

There is one other way of checking shop costs; by the performance of the locomotives after they have come from the shop. It is a general practise to assign a locomotive an anticipated mileage up to the next shopping and a comparison made of the actual mileage with the anticipated mileage. There are many other ways and means, however, by which the shop work can be checked. We have found it exceedingly interesting to keep a chart showing by individual locomotives the number of days out of service and the days when there were failures. Poor shop performance is frequently brought out by the large number of days that the engine is out of service for running repairs and an analysis of the cause of the detention for running repairs will indicate wherein the shop failed to do its work properly. From the standpoint of general performance of all locomotives turned out of the shop, it will be found of interest to compare the shop costs in various periods with the performance in the various classes of service. For example, the freight locomotives can be checked on the basis of the gross ton-miles per train-hour, the miles per locomotive day, the locomotive miles between shoppings, the fuel consumption per 1,000 gross ton-miles and the locomotive miles per failure. The passenger locomotive can be checked by the per cent of passenger trains on time, average miles per locomotive per day, miles between shoppings, pounds of coal per passenger car mile and miles per locomotive failure. The switching engines can be checked by the miles per day, the miles per failure, the miles between shopping and the pounds of coal per switching locomotive mile. In other words, in any analysis of shop costs from a standpoint of management, we should not confine our attention to the cost per locomotive, but must go further and compare these costs per unit of output with the performance of the engines after they have been turned out. The output may decrease and the cost per unit of output increase, but this may be due to improved standards of maintenance and to more rigid inspection, which, in turn, will result in a far better performance after the engines have been put in service. This has been the actual situation on more than one railroad under my observation.

In the case of passenger car repairs, there is no set rule as to the classification of output. At the present time, on the New Haven passenger car repairs are divided into two main classes—general and minor. In a general repair the paint is burned off; in a minor repair it is not. While it may be true that the heaviest expense in connection with the ordinary repairs to steel passenger cars is in the painting, such a segregation is of little value where there is a consistent program of installing steel underframes or re-building trucks on wooden cars or making extensive renewals of plates on steel cars. In other words, this segregation may be a fairly reasonable one for the New Haven at the present time where there is a large percentage of comparatively new steel cars and where there is relatively less work being done on wooden cars.

When the steel cars are older and there must be extensive repairs to the side plates on account of rusting around window sills, eaves, etc., the present classification will be comparatively worthless. On another railroad we found a dining car which was substantially re-built costing \$25,000. This job, under our classification, would be placed in the same class as a coach on which the ordinary general repair work was done, costing about one-sixth as much.

### Measuring Passenger Car Repair Output

The standard hour can be used here to excellent advantage. It provides an accurate measuring stick of just what work was put on the car, not on the basis of the time actually spent, but upon a standard time for doing that work. With a standard time, the same performance each time is given the same credit and the sum total of the operations can be expressed in the common unit of standard hours. If it is desired to maintain the present classes such as the division of the Boston & Maine repairs into five classes and the New Haven's into two, the output can be expressed in ratios of a general repair or a minor repair as measured by the relationship of the standard hours of each actual job to the average or normal standard hours for doing the ordinary amount of work for that class.

As to the costs of repairing passenger cars there is almost a complete lack of information. Frequently, not even the costs of repairing individual units or classes of equipment are kept. Such was the situation on the New Haven until fairly recently when a system was instituted by which the cost of repairing passenger cars was kept separately for each unit repaired. These units are then combined into classes so that we receive monthly report showing the cost per car for general and minor repairs divided as between steel and wooden cars and divided among the various classes—coach, baggage, combination, mail, milk, etc. These figures in themselves are extremely valuable. We have gone further than this, however, and have sub-divided the car so that we will obtain currently the information for the following sub-groupings: Scrubbing, trucks, platform, electrical work, inside carpenter work, outside carpenter work, tinsmith work, pipe work, painting, buffing, upholstering, and trimming.

With such sub-divisions it is possible to determine and check separately the operations of the various departments, and by applying the standard hours for the various operations we are able to tell the efficiency of the various departments. Where work is delayed in the shop or where the cost is too high, it is possible to tell readily and quickly where the weakness lies.

### Freight Car Repair Output

What I have said with reference to passenger car repairs applies equally to freight car repairs. As far as the output is concerned, there has been a tendency toward greater uniformity. The classes of freight car repairs are, for the most part, based upon the number of man-hours for doing the work. On the Boston & Maine a general repair must take 200 man-hours or over; a heavy repair from 20 to 199 man-hours, and a light repair from 1 to 19 man-hours. On the New Haven a Class 1 repair is anything in excess of 175 man-hours; a Class 2 repair 73 to 175 man-hours; a Class 3 repair from 37 to 72 man-hours; a Class 4 from 21 to 36 man-hours and a Class 5 repair under 20 man-hours. As far as the general sub-division between heavy and light is concerned, the New Haven and the Boston & Maine are on the same basis. The objection to the man-hour basis of subdividing freight car repairs is the same as that applying to the classification of passenger car or locomotive repairs in accordance with money spent. The greater the efficiency of the force, the less credit is given in the way of

units of output. This objection could readily be removed, if, instead of the actual hours, the standard hours were used. The objection to the actual hours is well shown by an example in a shop on the New Haven. When the bonus system of payment was introduced in this shop, the efficiency of the force gradually increased. With the additional compensation and the realization on the part of the men that they would receive as much in increased earnings as their efficiency permitted, the performance improved more. Almost all of the work being done at this shop was re-building of steel coal cars, a Class 1 repair. Yet, because most of the work was being done in less than 175 man-hours, this shop was being credited with a large number of Class 2 repairs, simply because the efficiency of the force had increased to that extent. If the standard hours had been used in this case, there would have been no difference on account of the increase in the efficiency of the force and the number of units of output would have been the same in the later as in the earlier period. It is not, however, necessary to use the standard hour where the data are not available from which standard hours can be compiled. The important classes of freight car repairs can be sub-divided just as in the case of locomotives and the classification made to depend upon the extent of the renewals of floor, sides, roof, sills, trucks, etc.

From the standpoint of costs, we should have for freight car repairs either the cost of the individual jobs or the cost by classes of cars. On the New Haven we receive monthly the costs of heavy repairs to box cars, coal cars, flat cars and refrigerator cars. In addition, as in the case of passenger cars and locomotives, we are arranging to obtain the information as to the cost of repairing the different parts of the car. In this case, the sub-divisions are as follows: Stripping, jacking up, trucks, underframe, draft gear and couplers, stringers and flooring, framing, inside lining, outside sheathing, roofing, door track and doors, brake and pipe work, safety appliances and painting and stenciling.

In this way it is possible not only to keep track of the cost of doing the various kinds of work, but by a comparison of the standard hours, it is possible to tell the relative efficiency of various groups of men doing the different kinds of work.

### The Method of Sampling

It is quite likely, as I have enumerated at great length the various reports and kinds of information which seem to me to be of value to the mechanical officer, I have given you the impression that he should be spending most of his time analyzing reports rather than observing the work being done. Elaborate reports are not valuable. The fewer the reports and the more simple they are, the better, but if we are to have any reports at all (and it is obvious that we must have some), those reports should be sufficiently comprehensive and accurate that they will be informative rather than provocative. They should give information rather than suggest questions. All of the information which I have suggested need not be used, nor need all of it be sent to all officers. It is obvious that the amount of information needed by the mechanical superintendent need not be as detailed as that made available to the shop superintendent, and the information for the general manager or other executive officers should be in considerable less detail than that available for the mechanical superintendent. If, however, the reports are outlined properly, the same basic data can be used for them all, the amount of detail being less for each grade of officer receiving any information as to shop output and costs.

It is not necessary to check each kind of operation each



day, week or month. The system of sampling and of analyzing cross sections of the work is being found more and more useful and satisfactory. We are using it in transportation statistics where there is also an immense mass of information. Different phases of operations can be checked in a general way each month and a detailed analysis made once in several months. In this way, it is possible to use the immense mass of mechanical statistics by having a few simple reports currently and by making detailed analyses periodically. For example, in checking the output of a locomotive shop, we could have our cost per unit of repair by classes of locomotives and by classes of work, together with the output, expressed in number of units equated on the basis of standard repairs or the number of classified repairs sub-divided into 15

rather than 5 classes. This information would not take long to analyze currently. Then periodically we could analyze the cost in detail of the boiler work, or the valve motion work, the tender work, rods, etc. Occasionally we could test out the cost of maintenance of different types of parts about which more information is needed. On this basis the amount of time necessary for the analysis would not be great and this fund of valuable information could be used.

We should not assume that our costs are low and our performance excellent simply because no one can prove that they are not, and because it may require intensive analysis and considerable expense to obtain accurate facts as to the efficiency of our mechanical performance, we should not assume that it is worthless to assume the expense until we have made the effort.

## House Committee Favors Surcharge

WASHINGTON, D. C.

A STRENUOUS fight has been made by the railroads and by others opposed to direct Congressional rate-making as well as to depletion of the carriers' revenues at this time, against the bill to abolish the Pullman surcharge, which was expected to be voted on in the House on Thursday, February 26, in the form of a Senate "rider" to the independent offices appropriation bill. An adverse report on the surcharge bill itself was ordered by the House committee on interstate and foreign commerce on February 21, after three days of hearings on the bill, by a vote of 16 to 2, Representatives Barkley of Kentucky and Parks of Arkansas being the only ones in favor of the bill, and on February 23 the committee submitted to the House the report by Chairman Winslow of the committee which was signed by 18 out of the 21 members, Representative Shallenberger not voting. Representatives Barkley and Parks filed a minority report. The filing of an adverse report was somewhat unusual as a committee which opposes a bill usually takes no further action after voting against it by tabling the measure. On the same day that the adverse report was filed the House conferees on the appropriation bill submitted their report stating that the conferees had not reached an agreement on the surcharge amendment adopted in the Senate, but sufficient time had been allowed for the members of the committee to inform themselves as to the facts regarding the bill, which had been passed by the Senate without either committee report or hearings, and by their report to furnish the information to other members of the House. Several members of the committee were also enabled to answer the speeches in favor of the abolition of the surcharge which were made in connection with the debate on other matters on several days before a vote on the appropriation bill was reached.

Before the hearings it had been rather generally assumed that the surcharge amendment adopted in the Senate would also be adopted by the House, as the organizations of commercial travellers had been exerting considerable pressure for the abolition of the charge and some 25 or 30 bills had been introduced for that purpose. However, after the hearings had demonstrated that the most of the Senators who had voted on the bill had done so under a misunderstanding of the facts and members of the House committee had shown themselves opposed to direct Congressional rate-making as well as to a reduction in the rates paid by those best able to pay which would tend to further postpone other rate reductions, a more optimistic feeling prevailed among those opposed to the

abolition of the surcharge. Also many telegrams have been received by members of Congress from representatives of the farmers strenuously opposing a reduction in the fares of Pullman passengers before reductions can be made in freight rates on agricultural products.

The report of the committee on interstate and foreign commerce was as follows:

The committee bases this adverse report on the following considerations:

1. This bill would initiate direct rate-making by Congress—a serious and unwise departure from long established policy (1887).
2. This precedent would open the doors for every interest dissatisfied with any existing rate to ask Congress to take on the commission's statutory duty as to rate making.
3. The removal of the surcharge would—
  - (a) Reduce service rates for those best able to pay.
  - (b) Result in raising other passenger and freight rates, or
  - (c) Postpone reductions in general passenger rates, or
  - (d) Postpone general reductions in freight rates on agriculture produce (including livestock) and other articles.
  - (e) Interfere with and retard the general survey and adjustment where possible, of freight rates as directed by the Hoch-Smith resolution recently enacted.

### Financial Considerations

- (a) Testimony (not disputed) showed revenue to railroads from surcharge for 1923 (the last complete yearly accounting available) was about \$37,000,000.
- (b) Assuming that carriers can stand a revenue reduction of \$37,000,000 there is no reason why the entire reduction should be made for the benefit of Pullman travelers.
- (c) If a cut in revenue of \$37,000,000 cannot fairly be made, and, nevertheless, the removal of the surcharge as such is desirable, other sources of income must be determined. No suggestion was made as to what rates should be increased in lieu of surcharge returns.
- (d) About \$18,000,000 of the \$37,000,000 goes to railroads earning a total of less than 5 per cent on their book value investment.
- (e) A large part of the \$19,089,564 which accrues from surcharge to railroads earning 5 per cent or more goes to carriers which would earn less than 5 per cent if the surcharge were removed.
- (f) Only \$8,627,000 goes to railroads earning over 6 per cent.
- (g) The earnings of certain important railroads earning less than 5 per cent would be depleted to an embarrassing extent if their surcharge incomes were taken away.

Only four persons out of every 100 buy railroad passenger transportation ride in Pullmans, and consequently 4 per cent pay all the surcharge.

No proponents appeared nor requested to be heard at the hearings except those representing organizations of commercial travelers.

Correspondence on file with the committee discloses but few communications from travelers for pleasure, tourists' organizations, associations or organizations fostering agriculture, manufacturing, or labor.

Of this correspondence there are several communications from employers of traveling salesmen in favor of the bill; but there is a

far greater representation from such employers who are opposed to the removal of the surcharge.

In view of the all-around seriousness of the proposal to remove the surcharge and the inevitable rate-making complications involved, the real responsibility for proving that the existing rate-making methods and the rates themselves are ill-advised is a clear obligation of those favoring the bill. We believe that the proponents have not proven their contention.

The existing surcharge was established by the Interstate Commerce Commission in 1920, concurrently with and as a part of, a general rate-schedule revision, including advanced passenger and freight rates, for the purpose of insuring necessary operating revenue to the railroads.

All surcharge receipts go to the railroads and none to the Pullman Company.

The bill purports to provide for the removal of the surcharge, but under its provisions it would also prohibit the levying of other railroad transportation charges, though just and reasonable, upon those desiring special accommodations and extra service in a Pullman sleeping or parlor car.

As of December 26, 1924, Mr. Elmore, statistical analyst of the Interstate Commerce Commission, reported on the Pullman surcharge to the commission.

The proponents of this bill referred to this report as proving their contention that a Pullman car could be operated by a railroad less expensively than a coach. This was only a partial finding.

In his conclusions covering all items entering into the cost of such operation Mr. Elmore stated in his report that the cost to the railroad for operating per car-mile on a daily trip of 112 miles for the coach was 44.81 cents and for the Pullman 49.37 cents; on a daily trip of 272 miles for the coach was 36.50 cents and for the Pullman 41.06 cents.

Mr. Elmore further reported in respect of the last figures as follows:

"The figures in these tables indicate that when car-mile costs, which embrace both line haul and terminal expense, are equaled for the same length of haul, the cost per car-mile of the Pullman is approximately 4.56 cents greater than that of the coach."

A brief debate on the bill was precipitated in the House on February 23 by Representative McKeown, who made a speech criticising the Interstate Commerce Commission in which he included a letter from a stockholder of the Pullman Company protesting against that company being made to "pull chestnuts out of the fire for the railroads." There was also some objection because the freight rates on farm products had not been reduced to a greater extent. Representative Hawes pointed out that the Senate had passed the surcharge bill without a hearing and he asked that the House await the report of its committee on the bill before discussing it. When Representative Oldfield spoke in favor of abolishing the surcharge and asked why the committee had taken no action on the bill until within the past few days Mr. Hawes said it had awaited the action of the Interstate Commerce Commission, which was created by Congress to decide such matters.

Mr. Hawes then made a speech in which he included the report of the committee and pointed out that if \$37,000,000 is taken from the railroads it will have to be made up on some other rates or will postpone the time when freight rates may be reduced. Representative McLaughlin of Nebraska also made a speech criticising the commission's decision on February 21.

### Hearings

H. W. Bikle, general attorney of the Pennsylvania, made the opening statement for the railroads in opposition to the bill at the hearing on February 19. He said the overshadowing public question as to whether a committee of Congress should act as an appellate tribunal to review a rate-making decision of the Interstate Commerce Commission was a large one in itself and would be discussed later by Mr. Thom, but incidentally he showed the committee the size of the record taken before the Interstate Commerce Commission in its investigation of about 18 months. Mr. Bikle began by showing the serious errors as to the facts that had been made by the Senators that made the leading speeches for the bill in the Senate.

For instance Senator Smith had told the Senate that the bulk of the surcharge is being collected by roads which have excess earnings amounting to \$160,000,000, whereas Mr. Bikle showed that the table used by Senator Smith of estimates made by the Interstate Commerce Commission's Bureau of Statistics indicated possible recapturable earnings for the four years 1920-1923 of \$79,000,000 which Senator Smith had taken in round numbers as \$80,000,000 and multiplied by two and that the estimate for 1923 was only \$36,000,000. Senator Smith and others had then stated that \$20,000,000 of the \$37,000,000 surcharge revenue had accrued to roads earning over 6 per cent, whereas Mr. Bikle showed that this was derived from a table used in Commissioner Campbell's dissenting opinion showing roads that had earned over 5 per cent, not 6 per cent. Mr. Bikle said that the same table, showing the amount of surcharge accruing to each road and their rate of return on book value for 1923, showed that only \$8,627,289 of the surcharge for that year went to roads earning over 6 per cent and that \$4,135,789 had gone to the New York Central, which showed 6.04 per cent, and which without the surcharge would not have been in the 6 per cent class. He also pointed out that much of the surcharge goes to roads that had a very low percentage on book value, including the New England lines. Also, he said, the 6 per cent on value is to be calculated by systems and when some of the roads are included in their systems they cease to show as much as 6 per cent on book value. In reply to the statement by Senators Smith and Robinson that the weaker roads do not get the surcharge but pay it to the Pullman Company under their contracts, Mr. Bikle said that the Pullman Company merely collects the surcharge and he showed that the table shows the exact amount received by each road regardless of any amount they may have to pay to the Pullman Company under their contracts.

Mr. Bikle also replied to the statements which had referred to the tentative report of Examiner Keeler, recommending the abolition of the surcharge, as a "unanimous report of a sub-commission" or as that of the chief examiner, saying that Mr. Keeler was but one of the commission's forty examiners and that after his report the commission had reopened the case, taken further evidence, received new briefs and heard oral arguments, which were attended almost throughout by all of the members of the commission. He mentioned this to show that the commission had given the case most thorough consideration.

Mr. Bikle also gave statistics to show that instead of the surcharge having reduced Pullman travel the latter had recently shown more of an increase than the coach travel; also to show that the average cost to the railroad per car-mile is greater for Pullman passengers than for coach passengers.

After showing that the railroads have never yet since the passage of the transportation act realized the  $5\frac{3}{4}$  per cent that the commission has declared represents a fair return, Mr. Bikle said that to take \$37,000,000 from their revenues will still further retard the time when they will be able to show a fair return. To illustrate the justification for the surcharge Mr. Bikle pointed to the various services performed and expenses incurred by the railroads for Pullman passengers which make the service performed for the latter a different thing from the transportation of the passenger in a coach, and he pointed out that a man who might buy all the space in a Pullman car is not allowed to ride upon payment of but one fare to the railroad but must buy 25 tickets, because he would be keeping the railroad from hauling that many passengers. He said the roads are not defending the surcharge on the



ground that those who ride in Pullmans can afford it but on the ground that if rates are to be reduced the last place to make a reduction is in the rates of those who can best afford to pay them. In reply to the suggestion that the railroads should get more revenue from the Pullman Company through revision of the contracts he said that as the Pullman Company's net revenue for 1923 was about \$13,000,000 the Pullman Company would have to collect more revenue from the passengers in order to give \$37,000,000 more to the roads from its own earnings, yet approximately the same end is attained under the plan of having the Pullman Company collect the surcharge for the railroads without any contract covering it.

The hearing was concluded on February 29 after statements by J. M. Coleman and Alfred P. Thom on behalf of the railroads and rebuttal statements by Samuel Blumberg and William J. Henderson, representing the commercial travelers' organizations. Mr. Thom said that it would not be possible for the Pullman Company to increase its own rates for the purpose of including something to be paid back to the railroad for service performed by the railroad in carrying its passengers, because the Pullman Company does not perform a transportation service and he pointed out that the railroad has to transport 11,000 pounds of deadweight for each Pullman passenger as against 7,000 for each coach passenger. Mr. Thom also argued that the bill proposes to limit the freedom of the Interstate Commerce Commission in regulating rates and is inconsistent with the resolution recently passed by Congress directing the commission to make a readjustment of the rate structure to see whether rates on basic commodities, such as agricultural products, may not be reduced. If the bill were to pass, he said, Congress would be saying to the commission that this part of the rate field must not be touched and it would be equally consistent to say that in readjusting rates for the benefit of agriculture the commission must not on any account increase the freight rates on automobiles. He also showed that many of the roads that receive considerable sums from the surcharge are the ones that serve the agricultural regions especially. In conclusion Mr. Thom said that the passage of the bill would mark a departure from the tried and time-honored policy of this country not to regulate through direct action of Congress but through a tribunal that has the time and the facilities for making a special study of such questions, and he asked whether the committee should attempt, after six hours of hearing, to reach a conclusion in review of that reached by the commission after a year and a half of investigation.

Mr. Blumberg said the travelers' organizations take the position that the surcharge is not exactly a rate but is more in the nature of a tax adopted for a special purpose in time of emergency when the financial condition of the carriers was much worse than it is now, and that wages have been reduced and net income increased since then; although he also stated that the commission had also reduced freight rates since then as an argument that it might also reduce passenger fares although the roads are earning less than the statutory return. However he insisted that it had not been shown that the roads are making less than a fair return when excessive maintenance expenditures are eliminated from the accounts. Irrespective of the question of revenue, he said, there is no basis for the surcharge because the Pullman Company and the railroads are each compensated for their service by the regular rates. Mr. Henderson, an accountant, took the position that the additional weight of a Pullman car is a less important factor than the fact that the average haul of Pullman passengers is longer, the density of traffic over the routes on which they move is greater and that there are less stops and starts in the case of Pullman passengers than in the case of coach traffic.

## Freight Car Loading

WASHINGTON, D. C.

**R**EVENUE freight car loading in the week ended February 14, which included the Lincoln's birthday holiday, amounted to 902,877 cars, a decrease as compared with the corresponding week of last year of 32,712 cars and an increase as compared with 1923 of 86,231 cars. Because of the holiday observed in many parts of the country this was also a decrease as compared with the preceding week. As compared with the corresponding week of 1924 there were reductions in all districts and in all classes of commodities except coke, ore, merchandise and miscellaneous. The cumulative loading for the year, however, is still ahead of that for last year. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

### REVENUE FREIGHT CAR LOADING

WEEK ENDED SATURDAY, FEBRUARY 14, 1925

Districts	1925	1924	1923
Eastern .....	214,439	225,345	195,140
Allegheny .....	185,085	194,129	180,571
Pocahontas .....	44,508	44,551	31,807
Southern .....	147,212	148,857	136,014
Northwestern .....	113,496	122,066	89,549
Central Western .....	131,468	139,486	130,348
Southwestern .....	66,669	61,155	53,217
Total Western districts .....	311,633	322,707	273,114
Commodities			
Grain and grain products .....	41,414	53,102	38,474
Livestock .....	30,532	33,841	29,430
Coal .....	170,596	193,556	183,241
Coke .....	13,314	13,061	15,115
Forest Products .....	79,528	83,896	58,658
Ore .....	11,059	9,795	9,014
Merchandise, l. c. l. ....	308,595	307,876	208,808
Miscellaneous .....	308,595	307,876	273,906
Total .....	902,877	935,589	816,646
February 7 .....	928,244	906,017	849,352
January 31 .....	896,055	929,623	865,414
January 24 .....	924,254	891,481	869,464
January 17 .....	932,150	894,851	864,297
Cumulative total, seven weeks .....	6,281,114	6,235,876	5,905,377

The freight car surplus in the first week of February showed a further decrease of 14,711 cars to 199,210 cars, including 63,561 coal cars and 96,786 box cars.

The Canadian roads for the same week had a surplus of 26,815 cars, including 22,840 box cars and 300 coal cars.

For the period February 8-14 the freight car surplus showed an increase to 220,798 cars, including 84,602 coal cars and 94,795 box cars. For the same period the Canadian roads had a surplus of 26,000 cars, including 21,925 box cars and 300 coal cars.

### Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended February 14 aggregated 53,836 cars, as against 53,015 cars in the previous week and 53,040 cars in the same week last year. Grain loading continued lighter than last year but this was offset by heavier coal loading (the Nova Scotia mines were not working at this time last year). Other forest products showed an increase of 503 cars, merchandise an increase of 1,259 cars and miscellaneous freight fell off 1,156 cars.

Commodities—	Total for Canada			Cumulative totals to date	
	Feb. 14 1925	Feb. 7 1925	Feb. 16 1924	1925	1924
Grain and grain products...	6,973	6,599	8,883	43,881	58,714
Live stock .....	1,979	2,160	1,999	16,338	14,102
Coal .....	5,723	6,368	3,225	42,979	31,500
Coke .....	372	282	368	2,169	1,880
Lumber .....	3,123	2,788	3,307	18,673	18,755
Pulpwood .....	4,260	4,587	4,402	27,560	23,058
Pulp and paper .....	2,324	2,262	2,430	14,284	14,704
Other forest products .....	3,679	3,841	3,176	21,266	19,321
Ore .....	1,022	1,125	972	7,775	6,069
Merchandise l. c. l. ....	14,368	13,547	13,109	92,099	83,710
Miscellaneous .....	10,013	9,456	11,169	65,028	68,076
Total cars loaded .....	53,836	53,015	53,040	352,052	339,889
Total cars rec'd from connections .....	37,975	35,219	37,968	227,539	223,818

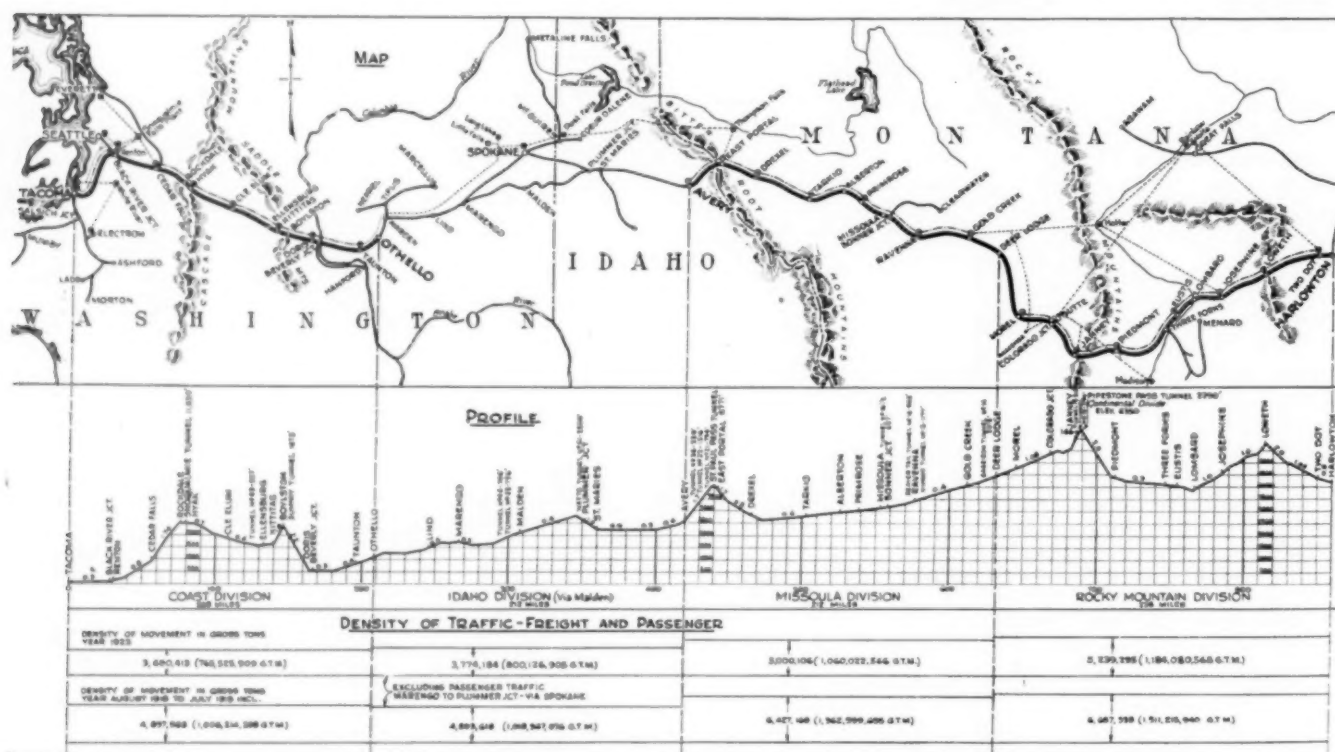
# St. Paul's Electrification Shows Economies Over Steam

*A study of comparative costs on 648 miles of line indicates saving for electric operation*

**A**FTER nearly nine years of operation on 438 miles of its 648 miles of electrified lines and nearly five years of service on the remaining 210 miles the Chicago, Milwaukee & St. Paul has made a detailed study of the comparative cost of operation electrically with that of previous operation with steam power which shows a marked saving from electrification. The report, signed by H. E. Byram, president, was prepared under the direc-

and above interest and carrying charges has been \$12,400,007.

The St. Paul started the electrification of its line in the Rocky Mountains in 1914. The first section, passing over the Big Belt and the Rocky mountains between Harlowton, Mont., and Deer Lodge, including 226 miles of first main and 66 miles of other tracks, was placed in service in April, 1916. The Missoula division, passing over the



Map, Profile and Traffic Density Chart of Electrified Territories

tion of W. W. K. Sparrow, vice-president, by Chester Oliphant, assistant comptroller, in consultation with R. Beeuwkes, electrical engineer. It indicates that on a net additional investment for electrification of \$15,625,739, as explained in detail later, the saving to date over

Bitter Root range between Deer Lodge, Mont., and Avery, Idaho, and including 212 miles of first main and 62 miles of other tracks, was placed in electric operation in November, 1916.

This project, comprising a total of 438 miles of main

TABLE I—VARIATIONS IN TRAFFIC AND SAVINGS RESULTING FROM ELECTRICAL OPERATION, FIGURED ON PRICE LEVELS OF 1923

Years	Harlowton to Avery—Electrical operation began April and Nov., 1916		Othello to Tacoma—Electrical operation began March, 1920		All electrified sections	
	Volume of traffic—gross ton-miles, freight and passenger	Net savings by electrification	Volume of traffic—gross ton-miles, frt. and pass.	Net savings by electrification	Volume of traffic—gross ton-miles, frt. and pass.	Net savings by electrification
1916	†1,639,054,000	†\$1,098,166			1,639,054,000	\$1,098,166
1917	2,677,097,000	1,641,369			2,677,097,000	1,641,369
1918	2,759,178,000	1,734,687			2,759,178,000	1,734,687
1919	2,894,063,000	1,888,037			2,894,063,000	1,888,037
1920	2,710,745,000	1,679,623	*691,674,000	*\$249,003	3,402,419,000	1,928,626
1921	1,812,714,000	638,651	664,238,000	12,363	2,476,952,000	671,014
1922	2,109,868,000	996,485	734,121,000	103,301	2,843,989,000	1,099,786
1923	2,247,102,000	1,152,308	746,405,000	119,285	2,993,507,000	1,271,793
1924	2,129,426,000	1,018,721	691,476,000	47,808	2,820,902,000	1,066,529
Total		\$11,868,247		\$531,760		\$12,400,007

†Tonnage and savings for 6½ months.  
\*Tonnage and savings for 9 months.



line from Harlowton to Avery, covered what was previously four steam engine districts with intermediate terminals at Three Forks, Deer Lodge and Alberton. The Belt mountains are crossed at Summit, 45 miles west of Harlowton, at an elevation of 5,795 ft., with a one per cent grade 14 miles long on the eastern slope and a similar grade 44 miles long on the western slope. The length of this latter grade presented one of the most serious problems encountered in this installation. The Rocky mountains are crossed at Donald, 124 miles west of Summit and 18 miles east of Butte, at an elevation of 6,350 ft. The eastern slope includes 20.8 miles of two per cent grade and the western slope 10 miles of 1.66 per cent grade. The third district between Deer Lodge and Alberton descends continuously westward on a maximum grade of 0.4 per cent. The crossing of the Bitter Root mountains is made at Roland, Idaho, at an elevation of 4,200 ft. The summit is reached by 12 miles of 1.7 per cent grade on the eastern slope and 24 miles of 1.7 per cent grade on the western slope. Over 6,250 ft. of rise and fall is overcome between Harlowton and Avery.

As would be expected in such mountainous country, the curvature is heavy, the maximum degree of curve being 10 deg. There are 36 tunnels between Harlowton and Avery, 16 of which are on the western slope of the Bitter Root mountains. The longest is the St. Paul Pass tunnel at the summit of the Bitter Root mountains, 8,751 ft. in length.

The traffic each way daily consists of two heavy trans-

continental passenger trains with occasional special passenger and milk trains, and an average of four tonnage freight trains with a local freight every second day. The freight traffic amounts to about 15,000 gross tons daily. Under ordinary conditions the prevailing tonnage is eastbound and consists largely of grain, lumber and other dead freight. Normally one time freight is able to handle all eastbound expedite business. Westbound, nearly all of the traffic consists of merchandise and other time freight.

With steam locomotives a 2,000-ton train was hauled up one per cent grades with one Mallet road engine, helpers being added on the heavier grades. Seven engines were held in this service on the Rocky Mountain division, as compared with an average of 23 road engines.

The St. Paul secured the coal used between Harlowton and Avery from company mines located on its line at Roundup, Mont. In 1923 the coal for the Rocky Mountain division cost an average of \$3 per ton at the point of use. During 1915 oil was used as locomotive fuel on the Missoula division, the oil being hauled from Puget Sound points. The oil equivalent to a ton of coal cost about \$3.65 laid down at the point of use in 1923.

The electrification of the Coast division, from Othello, Wash., to Tacoma was placed in operation in March 1920. This territory includes 208 miles of first main and 72 miles of side and yard tracks, and passes over the Saddle mountains and the Cascade mountains. The summit of the Saddle range is at Boylston, altitude 2,390 ft.,

TABLE II—OPERATING EXPENSES DIRECTLY AFFECTED BY CHANGE IN POWER—HARLOWTON TO AVERY

I. C. C. accts.	Classification of expenses—Description	Steam operation— Costs of the year 1915 adjusted to the price levels of 1923			Electrical operation— Actual costs of the year 1923		
		*Variable		*Constant frt. and pass. (5)	*Variable		*Constant frt. and pass. (8)
		Freight (3)	Passenger (4)		Freight (6)	Passenger (7)	
	Maintenance of way and structures:						
201	Superintendence .....			\$94,472			\$95,208
231	Water stations .....			23,800			
233	Fuel stations .....			9,930			
235	Shops and enginehouses .....			42,383			33,927
249	Signals and interlockers .....			52,131			47,671
255	Power substation buildings .....						1,530
257	Power transmission systems .....						2,913
259	Power distribution systems .....						40,763
261	Power line poles and fixtures .....						18,379
271	Small tools and supplies (for M. of Elec. Prop. only) .....						847
	Total maintenance of way and structures .....			\$222,716			\$241,238
	Maintenance of equipment:						
301	Superintendence .....			\$120,194			\$105,440
306	Power substation apparatus .....						19,163
308-11	Locomotive repairs—Train .....	\$687,824	\$218,725		\$190,390	\$135,349	
308-11	Locomotive repairs—Switch .....	37,105			12,510	77	
314-17	Brake shoe and rigging, wheel and draft rigging wear .....	21,352	11,622				
326	Trolley maintenance cars—Only .....						2,757
	Total maintenance of equipment .....	\$746,281	\$230,347	\$120,194	\$202,900	\$135,426	\$127,360
	Transportation:						
371	Superintendence .....			\$70,240			\$61,407
377	Yardmasters and yard clerks .....			17,055			17,055
378	Yard conductors and brakemen .....	\$61,533			\$27,174	\$166	
379	Yard switch and signal tenders .....			1,189			548
380-81	Yard enginemen—Yard motormen .....	39,644			17,990	110	
382-84	Fuel for yard locomotives—Yard switch, power purchased .....	43,315					9,489
383	Yard switching power produced .....						1,053
385	Water for yard locomotives .....	1,257					
386	Lubricants for yard locomotives .....	777			394	1	
387	Other supplies for yard locomotives .....	808			302	1	
388	Enginehouse expense—Yard .....	12,431			4,131	25	
389	Yard supplies and expenses .....			712			328
392-93	Train enginemen—Train motormen .....	400,421	121,341		231,352	77,778	
394-96	Fuel for train locomotives—Train power purchased .....	886,009	270,693				754,231
395	Train power produced .....						87,135
397	Water for train locomotives .....	24,939	7,556				
398	Lubricants for train locomotives .....	14,534	3,360		9,979	4,811	
399	Other supplies for train locomotives .....	19,018	5,381		4,831	2,470	
400	Enginehouse expense—Train .....	142,283	66,330		42,341	40,531	
401	Trainmen .....	317,041	94,649		197,067	94,649	
402	Train supplies and expenses (Train—Light and heat) .....					12,883	
404	Signal and interlocker operation .....			40,841			31,517
	Total transportation .....	\$1,964,010	\$569,310	\$130,037	\$535,561	\$233,425	\$962,763
	Work train expense—All other than included above in M. of W. & S. adjusted to 1923 work train miles .....			\$74,721			\$62,415
	Totals for operating expenses directly affected (Gr. Tot. Stm. \$4,057, 616; Gr. Tot. Elec. \$2,501,088) .....	\$2,710,291	\$799,657	\$547,668	\$738,461	\$368,851	\$1,393,776
	Gross ton-miles in thousands—the work performed (Gr. Tot. Stm. 2,178,631; Gr. Tot. Elec. 2,247,102) .....	1,758,726	419,905		1,827,197	419,905	
	Cost per 1,000 gross ton miles .....	\$1.54105	\$1.90438		\$4.0415	\$8.7842	

\*"Variable"—Expenses considered to vary practically directly with volume of traffic: "Constant"—Expenses considered to remain practically constant for all volumes of traffic within a reasonable range.

†The actual for the period, 354,054,000, adjusted to the tonnage of electrical operation as the difference rests solely in the number of cars per train: Expenses adjusted to conform.

while at the Snoqualmie tunnel, the summit of the Cascade range, the altitude is 2,562 ft. The maximum grade of 2.2 per cent extends for 12 miles from Doris to Boylston. The maximum grade on the west slope is 1.74 per cent on 19.2 miles between Rockdale and Cedar Falls.

The direct-current-overhead-trolley type of electrification is used. Twin trolley construction is employed to avoid sparking. Current is purchased at taps in the high tension lines along the right-of-way and transmitted to sub-stations where it is stepped down from three-phase alternating current at 100,000 volts to a working voltage of 2,300 and thence converted through motor generators to direct current at 3,000 volts for distribution on the trolley. The motors of the locomotives are so constructed as to act as generators when descending grades, thus returning current to the line and controlling the speed of trains without mechanical braking.

The complete locomotive equipment for the electrified territories consists of 13 passenger, 42 freight and 4 yard locomotives. The tractive effort of these locomotives varies with the time required to pull up the trade. The equivalent number of steam locomotives necessary would be 133 freight, 23 passenger and 10 switching locomotives.

Since the electrification was placed in service marked

fluctuations in the volume of traffic have been caused by the war time peak and by the slump in 1921. During 1915, the last year of steam transportation on the Harlowton-Avery section, this territory handled 2,178,631,000 gross ton-miles of passenger and freight traffic. The electrification was completed in November, 1916. The years 1917-1920 saw the peak traffic, the maximum occurring in 1919, when 2,894,063,000 gross ton-miles were handled. After the slump in 1921, when only 1,812,714,000 ton-miles were carried, the curve again began to rise and in 1923 the load amounted to 2,247,102,000 ton-miles which is approximately equal to that of 1915. For the purpose of a study of steam and electrical operation the years 1915 and 1923 are compared.

On the Coast division the electrification was placed in full service in May, 1920. The year ending July 31, 1919, was therefore chosen as the steam period for comparison with the year 1923 as the electrical period. However, in this case the steam period included a traffic of 1,014,511,000 ton-miles, considerably larger than the electrical operating year with only 746,405,000—a situation favoring steam operation to some extent in the comparison.

The cost of steam operation for the year 1923, if this form of operation had been employed on these electrified

TABLE III—OPERATING EXPENSES DIRECTLY AFFECTED BY CHANGE IN POWER—OTHELLO TO TACOMA

I. C. C. accs.	Classification of expenses—Description	Steam operation— Costs of the year, August, 1918 to July, 1919, inclusive, adjusted to the price levels of 1923			Electrical operation— Actual costs of the year 1923		
		*Variable		*Constant	*Variable		*Constant
		Freight (3)	Passenger (4)	frt. and pass. (5)	Freight (6)	Passenger (7)	frt. and pass. (8)
(1)	(2)						
	Maintenance of way and structures:						
201	Superintendence .....			\$48,295			\$49,777
231	Water stations .....			8,273			
233	Fuel stations .....			5,215			
235	Shops and enginehouses .....			16,234			12,513
249	Signals and interlockers .....			33,202			31,343
255	Power substation buildings .....						2,047
257	Power transmission systems .....						5,179
259	Power distribution systems .....						19,723
261	Power line poles and fixtures .....						11,066
271	Small tools and supplies (for M. of Elec. Prop. only) .....						365
	Total maintenance of way and structures .....			\$111,219			\$132,013
	Maintenance of equipment:						
301	Superintendence .....			\$31,105			\$22,306
306	Power substation apparatus .....						7,891
308-11	Locomotive repairs—Train .....	\$326,467	\$129,174		\$78,549	\$60,703	
308-11	Locomotive repairs—Switch .....	24,141			2,658		
314-17	Brake shoe and rigging, wheel and draft rigging wear .....	18,000	7,000				
326	Trolley maintenance cars—Only .....						714
	Total maintenance of equipment .....	\$368,608	\$136,174	\$31,105	\$81,207	\$60,703	\$30,911
	Transportation:						
371	Superintendence .....			\$35,097			\$34,126
377	Yardmasters and yard clerks .....			6,708			3,268
378	Yard conductors and brakemen .....	\$40,560			\$10,038		
379	Yard switch and signal tenders .....			2,047			578
380-81	Yard engineers—Yard motormen .....	25,629			6,396		
382-84	Fuel for yard locomotives—Yard switch, power purchased .....	24,763					2,714
383	Yard switching power produced .....						447
385	Water for yard locomotives .....	602					
386	Lubricants for yard locomotives .....	506			105		
387	Other supplies for yard locomotives .....	526			44		
388	Enginehouse expense—Yard .....	6,845			1,186		
389	Yard supplies and expenses .....			314			62
392-93	Train engineers—Train motormen .....	233,323	69,674		92,224	38,095	
394-96	Fuel for train locomotives—Train power purchased .....	493,807	186,446				\$319,634
395	Train power produced .....						53,301
397	Water for train locomotives .....	11,710	4,548				
398	Lubricants for train locomotives .....	5,606	1,758		4,804	2,171	
399	Other supplies for train locomotives .....	7,211	2,778		3,485	1,999	
400	Enginehouse expense—Train .....	45,959	29,252		14,554	16,127	
401	Trainmen .....	264,338	60,644		107,183	47,698	
402	Train supplies and expenses (Train—Light and heat) .....					7,723	
404	Signal and interlocker operation .....			19,248			1,380
	Total transportation .....	\$1,161,385	\$355,100	\$63,414	\$240,019	\$113,813	\$428,510
	Work train expense—All other than included above in M. of W. & S. adjusted to 1923 work train-miles .....			\$50,452			\$39,676
	Totals for operating expenses directly affected (Gr. Tot. Stm. \$2,277,457; Gr. Tot. Elec. \$1,126,852) .....	\$1,529,993	\$491,274	\$256,190	\$321,226	\$174,516	\$631,110
	Gross ton miles in thousands—the work performed (Gt. Tot. Stm. 1,014,511; Gr. Tot. Elec. 746,405) .....	805,830	208,681		537,724	208,681	
	Cost per 1,000 gross ton miles .....	\$1.89865	\$2.35419		\$5.9738	\$8.3628	

\*"Variable"—Expenses considered to vary practically directly with volume of traffic: "Constant"—Expenses considered to remain practically constant for all volumes of traffic within a reasonable range.

†Constant up to a total of 906,097,000 gross ton miles for freight and passenger services; thence increased in freight service as estimated necessary for greater volumes of traffic: (The amount to be added at 1,014,511,000 G. T. M. is \$38,307.00.)

‡The actual for the period, 186,232, adjusted to the tonnage of electrical operation as the difference rests solely in the number of cars per train due to difference in train routing: Expenses adjusted to conform.



sections, is based upon the actual cost of steam operation for the last 12 months that such operation was in effect, adjusted to the costs prevailing in 1923. The sections were electrified at different times and have different physical and traffic characteristics, as well as different investment costs. For these reasons the report deals with the cost of steam and electrical operations on each section separately.

Under either method of operation some costs, within reasonable limits, remain constant while others vary with the volume of traffic. Because of the total tonnage moved in each year being different, the unit cost, or cost per gross ton-mile for the tonnage handled in the selected years of steam operation is not comparable with the cost per gross ton-mile for the tonnage handled in the year of electrical operation. In order, therefore, to make an accurate comparison and determine the differences in cost between the two methods of operation, the costs as

case of the Rocky Mountain and Missoula divisions, where there was little variation in the volume of tonnage as between the selected years of steam and electrical operation, are within practical limits, a true assumption, and that any possible variation would be slight and of no consequence. In the case of the Coast division where the tonnage in the year of electrical operation was very low in comparison with that of the steam period, any variation from the assumption made would have the effect of making the unit costs of electrical operation for the higher tonnages as shown in this report greater than they should be, and be. Due to the difference in the cost levels obtaining in the different years in which the property not common to both uses was acquired, there is a considerable difference in the investment cost of such property. As interest and depreciation charges on all property used solely for either operation are in this report charged against the form of operation to which they apply, it is just as necessary to a true comparison of cost to restate such investment costs for a period having the same cost levels as it was to restate the cost of labor and material used in operation.

This has been done, using for the electrical property the actual cost figures and for the steam property no longer in use on the electrified sections and which consequently has either been released for use on other divisions of the railroad, or retired from service, what such property would have cost new at the time of the purchase and installation of the electrical property.

No savings have been credited to electrical operation which are not susceptible of direct ascertainment, as for example, the possible increased revenue due to the release of equipment used in the transportation of coal when these divisions were under steam operation, better utilization of freight equipment due to faster movement, less wear and tear on road and equipment, less station expenses affected by the number of trains required to handle a given tonnage, or increase in passenger revenue due to the attractiveness and greater comfort of travel under electrified operation.

#### Savings Resulting from Electrical

##### Operation—Cost Level of 1923

Table I shows for the years since the beginning of electrical operation the net savings from electrical operation, using for steam operation the actual costs for the last 12 months of such operation, adjusted to the costs obtaining in 1923; and for electrical operation, the actual costs as determined for the year 1923. The net savings shown are obtained by deducting from the savings in operating expenses the carrying charges of interest and depreciation on the additional investment required by electrification. This additional investment amounts to \$15,625,739, as shown in detail later.

From this table it will be seen that for the year 1923, with its comparatively low tonnage, the net savings from electrical operation of the two sections amounted to \$1,271,793. For the minimum tonnage so far experienced, which was in the year 1921, the savings amounted to \$671,014. The maximum tonnage handled so far was in the year 1919. If the section from Othello to Tacoma had been under electrical operation during that year the savings for the two sections would have amounted to \$2,355,199. The total accrued net saving by electrification aggregates \$12,400,007, or slightly more than three-fourths of the cost of the electrification.

#### Operating Expenses Directly Affected

##### by Change in Power

Statements of the costs of electrical and steam operation as collected from the detail work sheets, together with certain traffic, fuel and locomotive statistics used or given consideration with the costs, are shown in Tables

TABLE IV—INVESTMENT IN AND CARRYING CHARGES ON THE PROPERTY PECULIAR TO EACH MODE OF OPERATION—HARLOWTON TO AVERY (438 Roadway miles)

Items	Investment	Carrying charges		Total
		Interest	Depreciation S. F. Basis	
		5%	6%	
Steam operation—Fixed property:				
Fuel and water stations, cinder pits, etc.....	\$630,000	\$31,500	\$16,695	.....
D. C. signal system.....	†.....	.....	.....	.....
Totals, fixed property....	\$630,000	\$31,500	\$16,695	\$48,195
Locomotives:				
Freight (incl. all pusher work service locomotives).....	\$2,470,628	\$123,531	\$28,165	.....
Passenger .....	356,039	17,802	4,059	.....
Switch .....	78,598	3,930	896	.....
Totals, locomotives.....	\$2,905,265	\$145,263	\$33,120	\$178,383
Totals, steam property..	\$3,535,265	\$176,763	\$49,815	\$226,578
Electrical operation—Fixed Property—				
Roadway buildings.....	\$89,545	\$4,477	\$2,382	.....
Power substation buildings..	535,157	26,758	3,361	.....
Power substation apparatus...	1,859,353	92,968	21,383	.....
Power transmission system...	715,181	35,759	5,435	.....
Power distribution system....	2,890,615	144,531	23,269	.....
Power line poles and fixtures.	1,091,721	54,586	50,110	.....
A. C. signal system.....	†197,446	9,872	1,374	.....
Engr.—Int. during construction and miscellaneous....	325,671	16,284	3,354	.....
Maintenance equipment.....	37,000	1,850	422	.....
Sub-total .....	\$7,741,689	\$387,085	\$111,090	\$498,175
Rental of transmission lines—				
Credit .....	.....	Cr.\$2,760	.....	Cr.\$2,760
Totals, fixed property....	\$7,741,689	\$384,325	\$111,090	\$495,415
Locomotives:				
Freight (incl. all pusher and work service locomotives) .....	\$2,881,112	\$144,056	\$32,845	.....
Passenger .....	927,408	46,370	10,573	.....
Switch .....	111,564	5,578	1,272	.....
Totals, locomotives.....	\$3,920,084	\$196,004	\$44,690	\$240,694
Totals, electrical property..	\$11,661,773	\$580,329	\$155,780	\$736,109
Increase in carrying charges—				
Account electrification.....	.....	.....	.....	\$509,531

\*Electrical operating property at actual cost 1914-15-16: Steam operating property priced as of the costs obtaining during the same period (1915).

†Net increase in investment chargeable to electrification included under electrical operation.

developed for the traffic of any one year had to be adjusted to conform to the volume of traffic of the other years. This adjustment was made by separating the costs between those items which, within practical limits for the range of tonnage under consideration, vary directly with the volume of traffic and those which remain constant.

When this has been done it is a simple matter to state the cost of steam operation for the tonnage of the year of electrical operation, and similarly the cost of electrical operation for the tonnage of the years of steam operation. The only assumption made in this adjustment is that the costs as separated between constants and variables have true varying and constant characteristics which, in the

II and III. The selection accounts used was made after a careful study of the expenditures under each of the primary accounts of the operating classification. Some of the accounts excluded as not being affected by the change in power are without doubt affected to some extent, but the effect is so slight as to be negligible in comparison with the effects produced by other causes. For example, "Maintenance of Track" is an expense unquestionably affected to some extent by the class or kind of power, but the effects from other causes such as weather, availability of money, cycles of renewals of parts, maintenance programs, labor conditions, etc., are so much greater and so impossible of exact ascertainment for elim-

data were available which would enable the brake shoe wear to be determined with any accuracy for the condition of continuous and long application which, under steam operation, occurs on mountain grades. Therefore, a wear figure, believed at least to be conservative, of one pound of wear per 100,000,000 foot-pounds of energy dissipated was used. There is also a saving in draft rigging and braking apparatus and in wheel wear, all of which are, for evident reasons where cars move over many divisions, indeterminable. The amount of savings on account of these items was assumed to be the same as that resulting from the reduction in brake shoes wear. This is believed to be conservative.

Costs of electric power are based upon a minimum total payment corresponding to the respective kilowatts for which the railway company in 1923 had exercised option for the different sections. Where these respective amounts of kilowatts are not sufficient to handle the increased traffic, power cost has been increased on the basis of the additional kilowatts required.

#### Separation of Affected Operating Expenses Between Constant and Varying Items

The total tonnage moved in the selected years, or any year that could have been selected, for steam operation was not the same as the tonnage moved in the year of electrical operation. Therefore, in order that the costs of electrical and steam operation might be stated for different volumes of traffic, within a reasonable range of the tonnage which has been handled over these divisions, without which a correct comparison between the cost of steam and electrical operations could not be made, the costs affected by a change from steam to electrical operation were separated between those which within reasonable limits remain constant for different volumes of traffic, because they are not connected with the direct movement of traffic, and those which on account of being connected with the movement of traffic vary directly with the volume of traffic. The expenses which within practical limits vary directly with the volume of traffic have been separated further between passenger and freight service, as such expenses can be directly assigned. With these separations in the expenses, the costs of operation for the volumes of traffic dealt with in this report may be obtained readily. It is only necessary to multiply the gross ton-miles of each service at any volume point by the respective unit costs developed, and to the sum of the products so derived add the total constant cost.

#### Carrying Charges on the Investment

The property here considered is the power equipment and the facilities and appurtenances directly related thereto—as, for example, in steam operation, the fuel and water stations and in electrical operation, the transmission and distribution systems, sub-stations, etc. The signal systems are also included as it was necessary to change out the direct current systems for the alternating current systems on account of the electrification.

Investment for the property peculiar to electrical operation was taken as of the actual cost of installation—on the Coast division, as of the prices obtaining in 1918 (1917 to 1919); on the Rocky Mountain and Missoula division, as of 1915. The carrying charges computed upon the investments and included as cost are interest and depreciation. The interest rate has been taken at the rate paid by the St. Paul during the different periods of installation—for the Coast division 6 per cent and for the Rocky Mountain and Missoula divisions 5 per cent. Depreciation has been computed upon the sinking fund basis, using an interest rate of 6 per cent.

TABLE V—INVESTMENT IN AND CARRYING CHARGES ON THE PROPERTY  
PECULIAR TO EACH MODE OF OPERATION—OTHELLO TO TACOMA  
(208 Roadway miles)

Items	Investment	Carrying charges		Total
		Interest 5%	Depreciation S. F. Basis 6%	
Steam operation—Fixed property:				
Fuel and water stations, cinder pits, etc.....	\$507,010	\$30,421	\$13,436	.....
D. C. signal system.....	612,000	36,720	6,793	.....
Totals, fixed property...	\$1,119,010	\$67,141	\$20,229	\$87,370
Locomotives:				
Freight (incl. all pusher and work service locomotives)...	\$2,135,785	\$128,147	\$24,348	.....
Passenger .....	430,231	25,814	4,905	.....
Switch .....	144,224	8,653	1,644	.....
Total, locomotives.....	\$2,710,240	\$162,614	\$30,897	\$193,511
Totals, steam property..	\$3,829,250	\$229,755	\$51,126	\$280,881
Electrical operation—Fixed property:				
Roadway buildings.....	\$114,215	\$6,853	\$3,027	.....
Power substation buildings..	452,808	27,168	2,875	.....
Power substation apparatus..	1,476,964	88,618	16,985	.....
Power transmission system...	549,521	32,971	5,072	.....
Power distribution system...	2,190,401	131,424	16,822	.....
Power line poles and fixtures.	966,563	57,994	40,596	.....
A. C. signal system.....	780,000	46,800	8,658	.....
Engr.—Int. during construction and miscellaneous.....	621,519	37,291	7,645	.....
Maintenance equipment.....	27,000	1,620	308	.....
Sub-total .....	\$7,178,991	\$430,739	\$101,988	\$532,727
Rental of transmission lines—Credit .....	.....	Cr.\$25,842	.....	Cr.\$25,842
Totals, fixed property...	\$7,178,991	\$404,897	\$101,988	\$506,885
Locomotives:				
Freight (incl. all pusher and work service locomotives)...	\$3,065,280	\$183,917	\$34,944	.....
Passenger .....	1,035,690	62,141	11,807	.....
Switch .....	48,520	2,911	553	.....
Totals, locomotives.....	\$4,149,490	\$248,969	\$47,304	\$296,273
Totals, electrical property..	\$11,328,481	\$653,866	\$149,292	\$803,158
Increase in carrying charges—Account electrification.....	.....	.....	.....	\$522,277

\*Electrical operating property at actual cost 1917-18-19; Steam operating property priced as of the costs obtaining during the same period (1918).

ination, that the expense can only be classified as not being affected by change in power. Work train expenses have been separated and included as expenses directly affected by changes in power for several reasons, one of which is that certain stand-by losses under steam operation are eliminated by using electric motors in work train service. The costs of the two periods have been adjusted to the same amount of work train service.

As the price levels of labor and material were not the same for the periods of electrical and steam operation, it was necessary to bring the costs to the same level so that a true comparison could be made. To this end the costs of the steam periods have been restated as of the electrical period and hence all the operating expense costs in this report are for the price levels of 1923.

With respect to the savings through the use of regenerative electric braking, it was found that no existing



# Fuel Consumption and Grade Revision

*Exerts major influence in economic analyses of line change in grade reduction projects on Kansas City Southern*

By F. A. Russell

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THE Kansas City Southern, extending from Kansas City, Mo., to Port Arthur, Texas, with a main line of 786 miles, and giving the shortest line from Kansas City to the Gulf of Mexico, has been in operation slightly over 25 years. Like most other roads, limited means necessitated the construction of a line with sharp curves and heavy grades. As business increased with the years, the outlook seemed to justify consideration of a comprehensive plan of improvement of line and grades. In 1906, the chairman of the board of directors was authorized to cause investigation to be made, the objects being. First—The determination of such changes and revisions in gradients and alignment of the main line, as will provide for the future commercial and operation requirements of the railway in the most efficient and economical manner practicable, the estimated cost of such improvements together with the amount of the justifiable expenditure therefore; and

grades of the Kansas City Southern between Kansas City and Port Arthur. It is the lowest ruling gradient compatible with little or no permanent duplication of operated road. . . .

Following the recommendations contained in the report of Mr. Burt, the work of reducing grades was undertaken during 1909 and extended over period of from three to four years, when at the end of 1912 the following had been accomplished:

Distance	Original Ruling Grade		Present Ruling Grade	
	N. B. Percent	S. B. Percent	N. B. Percent	S. B. Percent
Kansas City to Pittsburgh... 129.4	1.0	1.52	0.5	0.5
Second District—				
Pittsburgh to Neosho..... 44.7	1.0	1.16	0.5	1.16
Neosho to Watts..... 61.9	1.8	1.85	1.8	1.85
Watts to Heavener..... 102.1	1.0	1.0	0.5	0.5
Heavener to DeQueen..... 95.3	1.35	1.5	1.35	1.5
DeQueen to Shreveport..... 125.8	1.08	1.1	0.5	0.5
Shreveport to Leesville..... 110.5	1.08	1.0	1.08	1.0
Leesville to Port Arthur.... 117.5	1.0	1.0	0.5	0.5

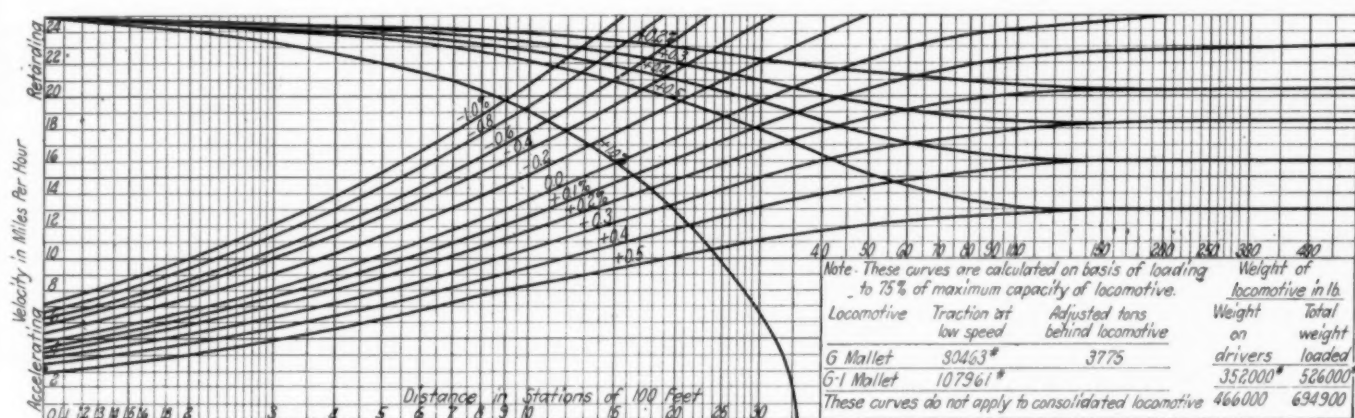


Fig. 1.—Velocity Distance Curves for 0.5 Per Cent Compensated Grades on Kansas City Southern

Second—The determination by divisions or districts of those changes and revisions (included in paragraph 1) that are now of the most important and will give the largest immediate return in proportion to the outlay, together with the amount of such outlay, and the justifiable expenditure required for such improvements. Horace G. Burt was engaged to make the investigation, a report of which was submitted in June, 1907.

In this report we find, "In the consideration of the matter of grade revision in any case, the first question is whether such revision is absolutely essential to the future growth and welfare of the railway; the second, whether the expenditure required for such revision is justifiable by the existing volume of traffic. The determination of proper answers to these questions involves a careful consideration and review of the business, present and prospective, of the railway under consideration and frequently, as in the case of the Kansas City Southern, exhaustive examinations and surveys for the purpose of determining the proper location and cost of the proposed improvements." Also, "A ruling gradient of 0.5 per cent (26.4 ft. per mile) is the one best adapted to the revision of

On the First district, a helper engine is employed to assist southbound trains (0.5 per cent loading), between Dodson and Grandview, a distance of 6.7 miles (Frisco joint track). On the Third district, helper engines are employed to assist trains with tonnage ratings for 0.5 per cent grades between Watts and Lyons, a distance of 29.7 miles. Helper engines are also employed on the Second district between Neosho and Watts, but tonnage ratings are below that of 0.5 per cent grades, due to the excessive ruling grade.

The tabulation indicates 66 per cent of the present engine districts are on the basis of 0.5 per cent ruling grades north bound as a result of work performed during the period from 1909 to 1912, the work undertaken and accomplished during that period being on the districts giving the largest return in proportion to the outlay required.

With a healthy growth in the volume of traffic since the date of Mr. Burt's report, the time is not for distant when consideration must be given the question of further reduction in operation costs by extending the plan of grade reduction over the territory from Pittsburg, Kans.,

to Watts to Lyons, Okla. (Second district and northerly end of Third district). This section embraces the Ozark Mountain region of the railway lying north of the Arkansas river. Between Pittsburg and Neosho, the country, like that adjoining on the north is rolling in character; from Neosho south to Lyons, the country, a high plateau ranging in elevation from 1,000 to 1,750 ft., is cut by stream flowing westerly to the Neosho (Grand) river, and southerly to the Arkansas river and lying from 200 to 400 ft. below the intervening plateaus or ridges. The present line traverses this Ozark region with maximum gradients ranging from 1 per cent to 1.61 per cent.

Since the original construction of the line and beginning with the surveys and investigation directed by Mr. Burt in 1906 and 1907, considerable time and expense have been applied to the work of locating a low grade line through this section.

The First district from Kansas City, Mo., to Pittsburg, Kans., 129.4 miles, is now on a 0.5 per cent ruling grade basis, and the Third district from Watts, Okla., to Heavener, Okla., 102.1 miles can be brought to a 0.5 per cent grade, with reasonable expenditure. This condition has concentrated study on the Second district, from Pittsburg, Kans., to Watts, Okla., 106.6 miles, which has a maximum grade of 1.8 per cent. Thorough investigation has been made by locating parties, both on and adjacent to the present operated line and also by use of other lines some distance away with a hope of finding a line of lower ruling grade whose cost would be justified under present traffic. These studies resulted in the problem of a choice from the following plans of improvement:

- (a) To build a 0.5 per cent line on and along the present operated line.
- (b) To build an 0.8 per cent line on and along the present operated line.
- (c) To build a 1 per cent line on and along the present operated line.

(4) To obtain a 0.5 per cent line by a detour to the west along the Spring and Grand rivers, using approximately 29 miles of a foreign line, building approximately 47 miles of new line, and revising the present grade line.

Economic studies were prepared for all of the above plans, trying out on each the different classes of motive power to determine that best adapted.

The principles involved in determining the economic justification of any plan of improvement are quite generally understood and need not be given in detail here, but in this study, there have been developed some phases of such analysis which may throw some light on a quite vital part of the problem.

In preparing the studies of comparative operating costs, only those items were considered, which would be affected by the adoption of any certain plan of improvement. Some of the more important of these items were as follows: Damage to track by trains, divided as between locomotives and cars; repairs to locomotives; repairs to cars; transportation expense, including wages, fuel, water, oil, etc.; curvature; helper service, etc. Of the above items, the larger by far is the transportation expense, and for the most part, the remainder of the article will deal with this phase of the problem, particularly the fuel question.

A. M. Wellington, who was the first to apply economic and scientific analysis to such problems, proposed the use of a formula which reduced to dollars and cents, the value of one foot of rise and fall. This method was used, for want of a better one, for many years, even though recognized to contain elements which could not be definitely determined.

Walter Loring Webb, in the preface of the seventh revised edition of his *Theory and Practice of Railroad*

Construction, says that he has omitted from his book all units of cost for one degree of curve, one foot of rise and fall and one mile of distance, for the reason that such units are unreliable, since they leave out certain operating characteristics peculiar to the line in question; and that the best method is to work out a comparison of operation costs for the two lines with a given volume of business. Operating records indicate that of the total direct train expense per train mile for through freight traffic, approximately 65 per cent is for fuel. Because this cost is very high (and the future outlook points to an increase rather than a decrease) and also because there is a great variation for lines of different maximum grades and different tonnage trains, a careful consideration of the problem is

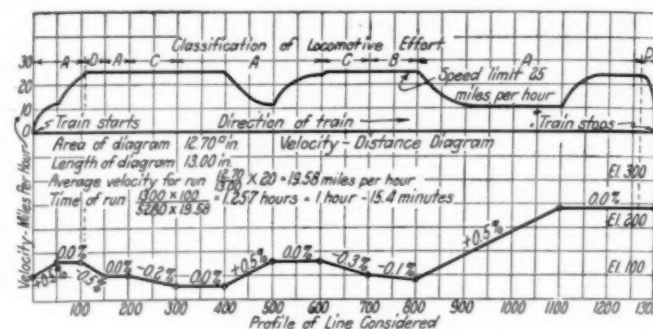


Fig. 2—Sample Velocity Distance Diagrams

very desirable when considering operating costs for any proposed line.

In using records of fuel consumption taken from actual operating conditions, it should be remembered that these will apply only to the conditions experienced on that particular line and will apply only on other lines on which grades and train loading are similar, which situation is not often found. For example, suppose we find that the fuel cost per train mile for the Mallet locomotive with 2,000 tons on a 1.5 per cent maximum grade is \$1. If we consider a 0.5 per cent line, it would not be correct to use the \$1 per train mile for fuel consumption again, even though the tonnage is rated for this grade so that on a maximum grade the locomotive is working under the same steam as on a 1.5 per cent grade. The reason for this is largely the variation in the distance which the locomotive is working full steam. Allowance has formerly been made for the variation in elevation to be overcome by the addition of a certain amount for each foot of "rise and fall," but this is unsatisfactory for a number of reasons. A great deal of the difference in rise and fall, where the grade is due to small undulations, can be overcome by operation under momentum and the cost is little more than for a straight level grade.

In order to get an accurate comparison, as between any two lines, the actual work performed by the locomotive in taking the train over the district must be obtained. If this can be done then all that remains is to tie this record into the actual performance record for the particular locomotive, line and loading which is available, and to bring the calculations for the other studies to this basis by a correction of this percentage of difference. This has been done by the following method:

The work performed by the locomotive is made possible by the release of energy stored in the coal. Therefore, assuming equal efficiency, the coal used is in direct proportion to the work performed. Work is the product of a force acting through a distance. If, therefore, we can get the force, which will be the draw bar pull, and the distance through which it acts, the total work done by the locomotive in pulling the train over the line can be calculated. For this, it is necessary to prepare velocity-dis-



tance diagrams for the various locomotives being loaded to make a certain velocity on this maximum grade.

Figure 1 is a sample of the velocity-distance diagram for a particular condition and will serve as illustration. There is nothing particularly different in the diagram from those often used, except that it has been found of advantage to use logarithmic graduations for the distances. By this means the lines for the different grades do not conflict for short distances, thus avoiding confusion, and, for the most part, the lines are not so violently curved as in rectangular plotting. Distances are indicated in 100-ft stations.

With this velocity-distance curve (Fig. 1), and the line under consideration, after determining the stations, railway crossings, etc., where a stop is necessary, a diagram is worked out on the profile which shows the velocity of the train at any point. A sample run from one station stop to the next is shown in Fig. 2. The area of this diagram, determined with a planimeter, when divided by the distance, gives the average velocity for the run, and the distance divided by the average velocity will give the time of run from start to stop.

It is now desired to make a classification of the line in respect to locomotive performance, or locomotive effort. This must be done by inspection, having available the locomotive diagram (Fig. 1), and the profile, together with the velocity-distance diagram (Fig. 2). At the beginning of a certain run, starting from a velocity of zero up to the time the velocity is up to the speed limit, the locomotive is taken as working maximum. When this speed limit is reached, the locomotive may work medium, easy or drift, depending on the grade, for each of which performances the work done is different and the coal consumption less, though never zero. The following classifications have been used for locomotive performance over the district:

Locomotive Performance Classification	Description	Per cent of Maximum Fuel Consumption per hour.
A	Loco. working maximum	100
B	Loco. working medium	75
C	Loco. working easy	50
D	Loco. drifting	17
E	Drifting on 0.5 per cent, brakes easy	17
F	Drifting on 1.0 per cent, brakes medium	17
G	Drifting on over 1.0 per cent, brakes hard	17
H	Time standing	11.3

The relation of the ratio of fuel consumption when the locomotive is "drifting" and "standing" has been taken from a record of a series of tests by A. K. Shurtleff and reported in Vol. 14, of the proceedings of the American Railway Engineering Association, second part, page 7. Those for classes B and C have been chosen arbitrarily as reasonable estimates, and since they will be used alike in each line under consideration, little error should result.

When diagrams and classification over the entire district have been completed, it is necessary to get the average velocity and the time for each class, A, B, C, etc., from which the following tabulation (Table 3) is made in order to demonstrate its uses.

TABLE NO. 3

## FUEL CONSUMPTION

G-Mallet Locomotive 3,775 tons .5 Per Cent Plan "D"

Speed Limit 25 M.P.H.

Loco. Effort	Miles	Ave. Speed M. P. H.	Hours Time	Consumption Rate	Consumption lb. Oil Hour	Total Consumption lb. Oil
A	76.00	18.25	4.17	100%	5,050	21,000
B	2.00	25.00	.083	75%	3,790	314
C	4.36	25.0	.175	50%	2,525	442
D	8.73	21.1	.413	17%	858	355
E	23.50	24.3	.970	17%	858	833
F	1.8	16.3	.110	17%	858	94
Standing			4.433	11.3%	571	2,530
Total—116.47						25,568

For Class A, the average speed equals 18.25 miles per hour for which the drawbar pull (taken from locomotive

rating sheet or dynamometer test) is 45,425 lb. The work done in one hour for the A classification would then be 45,425 lb. times 5,280 times 18.25 foot pounds. Using 6 per cent as the energy from the fuel which is delivered to the draw bar as useful work and 18,500 B.t.u. for the heat value of fuel oil, we have the following:

$$45425 \times 5280 \times 18.25$$

$$= 5068.6 \text{ lb. oil per hour.}$$

$$18500 \times 778 \times .06$$

The rate of consumption for Class B is taken at 75 per cent of this, C as 50 per cent, etc., which gives the rate of consumption per hour for the various classifications. Making extensions on the above with the time and rate gives the total consumption of 25,568 lb. of fuel oil for the trip over the district. Using \$1.44 as total delivery cost of a 310.8-lb. barrel of oil and the total distance over the district as 116.47 miles, we have

$$25568 \times 1.44$$

$$= \$1.018 = \text{Calculated fuel cost per}$$

$$310 \times 116.47$$

train mile.

It is now desirable to tie this in as nearly as possible with actual performance record as shown in operating statistics. Since this can not be done on a proposed line, it will be necessary to take some one class of locomotive in operation over the present operated line of the district, of which fuel consumption records are available, and make a calculated fuel consumption by the method explained above, and compare the results. The actual case will perhaps explain this more clearly.

TABLE NO. 4

Line	Present Operated Line (a)	Present Line Revised to 1.0% (b)	Present Line Revised to 0.825% (c)	Proposed 0.5% Detour		
	1	2	3	4	5	6
Ruling grade....	+1.8%	1.0%	0.825%	+0.5%	+0.5%	+0.5%
Length of line						
Miles .....	106.6	106.8	115.73	116.6	116.6	116.6
Time on road...9h. 11m.		10h. 18m.	10h. 18m.	10h. 19m.	9h. 15m.	9h. 15m.
Locomotive .... G-Mallet		G-1 Mallet	G-1 Mallet	G-Mallet	E-5Con.	E-4Con.
Traction .....	80500	107900	107900	80500	6500	55900
Tonnage .....	1970	2880	3375	3610	2890	2485
		Train Expense Per Mile				
Wages .....	\$0.439	\$0.494	\$0.470	\$0.440	\$0.364	\$0.360
Fuel .....	0.822	1.335	1.335	1.070	0.892	0.721
Lubricants .....	0.018	0.018	0.018	0.018	0.018	0.018
Water .....	0.061	0.087	0.087	0.078	0.065	0.061
Other supplies..	0.021	0.021	0.021	0.021	0.021	0.021
Total .....	\$1.361	\$1.955	\$1.931	\$1.627	\$1.360	\$1.181

Records were available for the G-Mallet Locomotive operating over the district, an average of which gave a fuel cost of \$0.822 per train mile. For this same train over the same district, theoretical calculation on fuel consumption by the method explained above gave a cost of \$0.782. Therefore in order to bring the calculated cost to the record cost, an increase of 5.1 per cent was necessary, and this increase was used on all other calculated costs for this district, whether on the present or proposed lines. The theoretical calculation of fuel costs, when applied on all lines alike would give accurate relative comparisons, but since it is desirable to conform as nearly as possible to actual operating statistics, this adjustment was made.

In Table 3, 4.43 hrs. is shown as the time standing, waiting for meets, etc. Records were available for the average time on road for the present operated line. The calculated running time was 4.43 hrs. less than this. For the proposed line of lower grade and a less number of trains, this last time would probably not be so great, but to be on the safe side, it is taken as the same and fuel consumption is calculated on that basis.

The application of the above outlined method in determining the train mile costs, as shown in Table No. 4, brings out rather interesting points, some of which are as follows:

Following the reduction of a district to a lower maxi-

TABLE NO. 5—GENERAL SUMMARY SHOWING METHOD OF SETTING UP RESULTS

Study No.	1	2	3	4	5	6	7
	Present operated line	1% along present line	0.825% along present line	Plan A	Plan B	0.5% Detour Plan C	Plan D
Description of items—							
Length of line in miles—through freight.....	106.6	106.8	115.73	116.6	116.6	116.6	116.6
Maximum grade—through freight.....	S.B. 1.8 N.B. 1.56	1%	0.825%	0.5%	0.5%	0.5%	0.5%
Degrees of angle—through freight.....	4,890	4,719	5,983	3,002	3,002	3,002	3,002
Rise and fall in feet—through freight.....	1,755	1,588	1,597	1,195	1,195	1,195	1,195
Locomotives to be used—through freight.....	G-Mallet	G-1 Mallet	G-1 Mallet	G-Mallet	G-Mallet	E-5 Loco.	E-5 Loco.
Tonnage per train—through freight.....	E-3 Helper						
Tonnage through freight each way per day.....	1,970	2,880	3,375	3,610	3,333	2,890	2,890
Tonnage through freight for year.....	19,000	10,000	10,000	10,000	10,000	10,000	10,000
Through freight locomotive trips.....	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000
Through freight locomotive miles.....	3,706	2,535	2,163	2,022	2,190	2,526	2,526
Through freight train expense per train mile.....	395,066	270,738	250,324	235,765	255,354	294,532	294,532
Operating costs—	1,361 not incl. helper	1,955	1,931	1,627	1,525	1,375	1,360
Rental to be paid.....	0	0	0	\$114,722	\$114,722	\$114,722	\$114,722
Damage to track—through freight.....	\$137,996	\$121,372	\$119,154	73,982	77,209	74,877	74,877
Damage to track—passenger.....	35,329	35,396	38,355	36,483	36,483	36,483	36,483
Damage to track—local freight.....	5,038	5,048	5,470	5,203	5,203	5,203	5,203
Increase in other damage to property.....	0	221	10,106	53,897	53,897	53,897	53,897
Repairs to locomotives—through freight.....	239,986	148,040	136,877	128,587	139,270	132,539	132,539
Repairs to locomotives—passenger.....	30,380	30,437	32,982	31,372	31,372	31,372	31,372
Repairs to locomotives—local freight.....	10,737	10,757	11,657	11,088	11,088	11,088	11,088
Depreciation—through freight locomotives.....	8,470	36,450	36,450	5,148	5,148	21,060	21,060
Repairs to cars—through freight.....	144,750	144,520	156,427	157,515	157,604	157,781	157,781
Repairs to cars—passenger.....	13,198	13,223	14,328	13,629	13,629	13,629	13,629
Repairs to cars—local freight.....	2,740	2,744	2,974	2,829	2,829	2,829	2,829
Transportation expense—through freight.....	610,438	529,293	483,376	383,590	389,415	404,982	400,564
Transportation expense—passenger.....	94,627	94,804	102,731	97,716	97,716	97,716	97,716
Transportation expense—local freight.....	35,134	35,200	38,143	36,281	36,281	36,281	36,281
Telegraph and station expense.....	7,450	7,450	7,450	40,604	40,604	40,604	40,604
Taxes on added length.....	0	260	9,130	48,690	48,690	48,690	48,690
Curvature—through freight.....	83,099	62,126	70,731	28,438	29,798	28,657	28,657
Curvature—passenger.....	15,369	14,832	18,805	11,315	11,315	11,315	11,315
Curvature—local freight.....	2,773	2,676	3,392	2,041	2,041	2,041	2,041
Helper service.....	Incl. above	0	0	0	0	0	0
Total for operation.....	1,477,513	1,294,789	1,298,538	1,283,130	1,304,314	1,325,766	1,321,348
Estimated cost of project.....	0	4,383,896	5,482,167	5,578,983	5,578,983	5,578,983	5,578,983
Add 15% for discount.....	0	657,584	822,325	836,847	836,847	836,847	836,847
Cost of equipment.....	423,497	860,000	860,000	257,385	257,385	468,000	468,000
Total cost.....	423,497	5,901,480	7,164,492	6,673,215	6,673,215	6,883,830	6,883,830
Interest at 5%.....	21,175	295,074	358,225	333,661	333,661	344,192	344,192
Total operating cost including interest.....	1,498,688	1,589,863	1,656,763	1,616,791	1,637,975	1,669,958	1,665,540
Deduct acct. credit new business.....		105,120	105,120	129,120	129,120	129,120	129,120
Net operation.....	1,498,688	1,484,743	1,551,643	1,487,671	1,508,855	1,540,838	1,536,420
Net gain over pres. op. line for year—							
For present traffic.....		13,945	—52,955	11,017	—10,167	—42,150	—37,732
For 50% increase in traffic.....		178,804	129,992	299,517		238,117	244,744
For 100% increase in traffic.....		339,102	308,382	592,065		522,374	531,210

Study No.	8	9	10	11	12	13	14	15
	5% Detour Plan E	1% modified line	Plan F	Plan G	5% Detour Plan H	Plan I	Plan J	Plan K
Description of items—								
Length of line in miles—through freight.....	116.6	107.9	114.0	114.0	114.0	114.0	114.0	114.0
Maximum grade—through freight.....	0.5%	1%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Degrees of angle—through freight.....	3,002	4,608	2,803	2,803	2,803	2,803	2,803	2,803
Rise and fall in feet—through freight.....	1,195	1,580	1,195	1,195	1,195	1,195	1,195	1,195
Locomotives to be used—through freight.....	E-4 Loco.	G-1 Mallet	G-Mallet	G-Mallet	E-5	G-1	G-1	E-4
Tonnage per train—through freight.....	2,485	2,880	3,610	3,333	2,890	4,000	3,333	2,485
Tonnage through freight each way per day.....	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Tonnage through freight for year.....	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000	7,300,000
Through freight locomotive trips.....	2,938	2,535	2,022	2,190	2,526	1,825	2,190	2,938
Through freight locomotive miles.....	342,571	273,527	230,508	249,660	287,964	208,050	249,660	334,932
Through freight train expense per train mile.....	1.181	1.812	1.627	1.520	1.375	2.159	2.130	1.181
Operating costs—								
Rental to be paid.....	\$114,722	0	\$114,722	\$114,722	\$114,722	\$114,722	\$114,722	\$114,722
Damage to track—through freight.....	74,722	122,622	71,788	74,846	72,657	79,362	88,339	72,507
Damage to track—passenger.....	38,483	35,760	35,654	35,654	35,654	35,654	35,654	35,654
Damage to track—local freight.....	5,203	5,100	5,085	5,085	5,085	5,085	5,085	5,085
Increase in other damage to property.....	53,897	1,439	51,019	51,019	51,019	51,019	51,019	51,019
Repairs to locomotives—through freight.....	149,996	149,565	125,719	136,165	129,584	113,762	136,514	138,829
Repairs to locomotives—passenger.....	31,372	30,751	30,659	30,659	30,659	30,659	30,659	30,659
Repairs to locomotives—local freight.....	11,088	10,868	10,836	10,836	10,836	10,836	10,836	10,836
Depreciation—through freight locomotives.....	4,861	36,450	5,148	5,148	21,060	32,400	32,400	4,861
Repairs to cars—through freight.....	157,959	146,009	154,002	154,090	154,262	153,936	154,090	154,437
Repairs to cars—passenger.....	13,629	13,359	13,319	13,319	13,319	13,319	13,319	13,319
Repairs to cars—local freight.....	2,829	2,773	2,765	2,765	2,765	2,765	2,765	2,765
Transportation expense—through freight.....	404,576	495,631	375,037	379,483	395,951	449,180	531,776	395,555
Transportation expense—passenger.....	97,716	95,781	95,497	95,497	95,497	95,497	95,497	95,497
Transportation expense—local freight.....	36,281	35,563	35,458	35,458	35,458	35,458	35,458	35,458
Telegraph and station expense.....	40,604	9,687	40,604	40,604	40,604	40,604	40,604	40,604
Taxes on added length.....	48,690	1,300	46,090	46,090	46,090	46,090	46,090	46,090
Curvature—through freight.....	28,627	60,664	26,553	27,823	26,757	29,717	33,409	26,729
Curvature—passenger.....	11,315	14,483	10,686	10,686	10,686	10,686	10,686	10,686
Curvature—local freight.....	2,041	2,613	1,928	1,928	1,928	1,928	1,928	1,928
Helper service.....		30,000	30,000	30,000	30,000	30,000	30,000	30,000
Total for operation.....	1,318,611	1,300,418	1,282,569	1,301,877	1,324,593	1,382,679	1,500,850	1,317,240
Estimated cost of project.....	5,578,983	4,268,974	4,260,838	4,260,838	4,260,838	4,260,838	4,260,838	4,260,838
Add 15% for discount.....	836,847	640,346	639,126	639,126	639,126	639,126	639,126	639,126
Cost of equipment.....	243,074	860,000	257,385	257,385	468,000	720,000	720,000	243,074
Total cost.....	6,658,904	5,769,320	5,157,349	5,157,349	5,367,964	5,619,964	5,619,964	5,143,038
Interest at 5%.....	332,945	288,466	257,867	257,867	268,398	280,998	280,998	257,152
Total operating cost including interest.....	1,651,556	1,588,884	1,540,436	1,559,744	1,592,991	1,663,677	1,781,848	1,574,392
Deduct acct. credit new business.....	129,120	105,120	129,120	129,120	129,120	129,120	129,120	129,120
Net operation.....	1,522,436	1,483,764	1,411,316	1,430,624	1,463,871	1,534,557	1,652,728	1,445,272
Net gain over pres. op. line for year—								
For present traffic.....	—23,748	14,924	87,372	68,064	34,817	—35,869	—154,040	53,416
For 50% increase in traffic.....	250,478	180,089	370,720		310,239	204,211		322,894
For 100% increase in traffic.....	528,692	340,694	658,059		589,652	448,280		596,365



imum grade, the locomotive being loaded for the grade in question, there results an increase both in the time on the road and the fuel cost per train mile. For the Present Operated Line, Col. 1, Table 4, the time on road is 9 hr. 11 min., and when the grade is reduced to 1.0 per cent the time is 10 hr. 18 min., an increase of more than one hour. Both estimates are for Mallet locomotives, the only difference being that one is larger and handles more tons. For fuel consumption per train mile, comparison must be made with the same locomotives. Table 4, Col. 1 for the G-Mallet locomotive on the 1.8 per cent district, shows a fuel cost of \$0.822 and Col. 4 shows a fuel cost of \$1.07 per train mile for the same locomotive on a 0.5 per cent district, or an increase of 30 per cent. The reason for this will be clearly set out when a table, similar to table No. 3, of locomotive performance is prepared for each locomotive. This will show that for the 0.5 per cent line, the locomotive is working on the ruling grade more than double the distance required for the higher grade lines.

In considering problems of this kind, undue weight is sometimes given to the item of wages of crew, and little attention is given to the variation in fuel costs for the different conditions. Referring again to Table 4, it will be seen that for the Present Operated Line, Col. 1, wages amount to \$0.439 while for Col. 2, where the length of line is practically the same and the time is one hour longer, wages amount to \$0.494 or an increase of \$0.055 per train mile. On the other hand, fuel cost, as shown above, may have a variation as great as 30 per cent for different lines, which in this case is \$0.25 and almost five times as much as the difference in wages. It will be seen that both these items are against the line of lower grade, and must be offset by the added tonnage per train.

In making a complete analysis of an operating district, to select the most economical line, there are a number of other items to be considered, a full discussion of which would be too voluminous for a paper of this kind. However, in order to demonstrate the method that has been used for the tabulation of results of studies. Table No. 5 has been prepared. While the lines in question for each study are not definitely described, and results shown are not necessarily exactly those developed in the studies, this table being for demonstration of method only, it is thought that it will serve the purpose as well as definite data.

In this table are listed results for 15 studies, the first being for operation on the present operated line and the remainder for different lines or different motive power and train load. The difference between the operating cost for the present line and the sum of the operating cost and interest on investment for the proposed lines shows the annual net gain (or loss) for present traffic and also for a 50 per cent and 100 per cent increase in traffic. All other things being equal, the line to be chosen and recommended for adoption would naturally be the one showing the greatest net gain for present and future traffic, so it is thought that no particular advantage would be gained from a discussion of these results in detail. However, a very careful study of the data shown in this table should be made before any recommendation is made, because there are several other items which are very important, though they can not be stated definitely in dollars. Some of the more important of these will be mentioned and discussed briefly.

1. Time on the Road.—Study No. 6 shows slightly over one hour less running time for a trip over the district than study No. 2. It is likely that in actual operation there would be a greater saving due to a less number of trains, but, considering only the one hour saving, some value certainly could be placed on the saving resulting from the use of the total number of cars for this time.

To make a rough comparison of this for the year, there will be

approximately 200,000 car trips over the district which, at a saving of one hour per trip, results in a saving of 8,350 car days, which at \$1 gives \$8,350.

2. Standing Time.—In addition to the above, it is estimated roughly that 40 per cent of the time lost by through freight trains in standing is in waiting for passenger trains. With the use of the 0.5 per cent detour, which is designed only for use of through freights (passenger trains using present line), there would result this saving in time. This would be reflected in the consumption of fuel, earlier release of equipment and an added attraction for traffic which is of a competitive nature. A rough estimate of the saving in fuel on the basis used in the main body of the estimate, shows \$11,550, and the saving in the use of cars of \$14,800. Nothing definite can be stated in regard to the increase in traffic that would result from the saving of time on the road, but this no doubt would attract considerable traffic now moving over other lines.

3. Repairs to Locomotives and Cars.—Repairs are calculated on a mileage basis and based on records of operation over the heavy grades of the present line. In the present report, the same rate per mile has been used on all lines due to the absence of definite proof to the contrary. The rates used are:

Locomotive repairs—G-Mallet .....	0.5454
Freight cars 3610 x .00023 x 0.8 .....	0.6642

Repairs for train mile ..... 1.2096

For obvious reasons, repairs would be lighter for the lower and more uniform grade than for the choppy grade of the present line. If we could say these repairs would be decreased 10 per cent, which seems quite conservative, this would result in a saving of \$0.121 per train mile, which for the 235,765 train miles would be \$28,528.

4. Proper balance of through Freight Train Loads.—The engine district on the north is now on a 0.5 per cent basis and the district on the south can with a reasonable expenditure and good economic showing, be brought to the 0.5 per cent grade. Bringing this district to a 0.5 per cent grade would permit the operation of three consecutive engine districts on the basis of a 0.5 per cent grade, which would reduce the cost and increase the efficiency of operation due to saving of time on the road, maintaining uniform train loads through terminals and permit the shifting of power from one district to another.

5. Permanency of 0.5 Per Cent Line.—As time goes on it is reasonable to assume that if not now, a time will come when traffic will justify the necessary expenditure to obtain the 0.5 per cent grade line in preference to the 1.0 per cent line. Should the 1.0 per cent line be built, it would only be justified up to a certain density of traffic, and would then become a burden on operation and a hindrance to the hope of later being able to build the 0.5 per cent grade line.

Since the report on this particular investigation is more for the description of method of attack rather than any specific data on the particular project, it might be worth while to set out some of the main features and conclusions of the study, even though some have already been mentioned.

1. No unit of cost has been used to account for the difference in rise and fall for the lines in question.

2. The basis for train operation cost is the time on the road and the calculated fuel consumption.

3. The basis of calculation of fuel consumed is the total foot pounds of energy delivered at the draw bar for the trip over the district.

4. The running time from start to stop is obtained from the velocity-distance diagram and is the length of the run divided by the average height of the diagram (which according to the scale used is the average velocity).

5. Calculated units are tied into actual operating units by a calculation on the operated line, and the per cent of difference used on all lines studied.

6. Errors in assumptions of items will be practically eliminated due to the same method being used on all lines and final results being correlated.

7. In case of a doubtful item, give the benefit to present operated line and require the proposed line to show a gain in spite of it.

Following are some observations on the results obtained. All of these have no doubt been experienced by railway operators, but the reasons for them may not have been so apparent.

1. The record cost of fuel per train mile on an operated line will not apply to the same locomotive on another line, even though tonnage is adjusted for the grade in question.

2. Reduction of a line to a lower grade and loading the locomotive for the lower grade will result in a longer time on the road and a greater fuel cost per train mile.

3. Differences in fuel costs per train mile will be several times greater than the difference in wages of crew, when a line is reduced to a lower grade.

## Railroad Correspondence and Its Possibilities

By George E. Schneider

**T**HE commercial agent of one of the railroads in the Southeast recently wrote the following letter to a shipper:

"The Elite Distributing Company,  
New Orleans, La.

"I beg to say L & N 6711, packing cases for the Jobbers Supply Co., Charleston, S. C., which was forwarded from New Orleans June 27th, reached destination June 30th and was delivered July 2nd."

This letter was a step in the right direction. It shows a desire on the part of the commercial agent to transmit the story of a good service to the shipper and thereby cultivate good will and encourage future business. But, as the letter is analyzed does it not appear that the situation offered a real opportunity for salesmanship, from the railroad point of view, of which advantage was not taken? The action it wanted to induce, principally the routing of future cars, was not even mentioned.

It would have taken only another minute to add a sales clincher. A salesman of commodities other than transportation would hardly have omitted the selling argument. Neither would the commercial agent, if he were talking to the shipper face to face, but when he wrote the letter his conversational habits forsook him. If this railroad had a correspondence supervisor, with a "nose" for the selling features involved, he would no doubt have caught this omission and have so explained the situation to the commercial agent that his future letters would be more complete and his work more effective. There is no reason of course why the letters of a commercial agent, like those of any other salesman, should not work for him when he is unable to make his calls in person.

Correspondence is receiving more than ordinary attention on the part of executives and managers, as business concerns are being judged to a large extent by the character of their letters. Realizing this tendency, wide awake executives are insisting that the correspondence emanating from their offices reflect and uphold the prestige of their organizations and be not out of harmony with established policies.

To accomplish this purpose a well defined control is placed upon all letter writing activities through the medium of correspondence supervisors, stenographic manuals, special training of correspondents and through departmental conferences. When it is considered that a firm's letters reach a larger number of customers and prospects than do salesmen, it may be realized how imperative it is that the impressions made by these written messages should not only forestall criticism, but should be drafted so as to assist in developing institutional good will. Recently in looking over several hundred letters from concerns of all sizes and in many kinds of business, the difference between the various types of correspondence was obvious and striking. The outstanding lack of those letters that could stand improvement was the freedom of any thought of "selling" the house. It appeared that the attitude of the different writers was simply that of having a task to perform and the quicker it was finished, without being intentionally discourteous, the quicker valuable time could be directed towards the accomplishment of something worth while. Most of the letters began with the usual acknowledgment of "favors received and duly noted" and ended with the customary "thanks for your inquiry (or order) and trusting to be favored, etc.," which clearly indicated a routine, stereotyped correspondence

habit. Of course the majority of the larger, national organizations, particularly on correspondence from their main offices, gave evidence of an internal effort towards correspondence improvement. You could sense an implied deference to the importance of the customer. The most noticeable exceptions among these larger organizations were the railroads. It seemed an unfortunate coincidence that most of their letters showed a lack of some correspondence detail, a consideration of which would have improved them very materially.

This brings up the thought that the railroads as a whole, notwithstanding the fact that correspondence plays as large, or a larger part, in their relations with the public than is the case with most other industries, and where the carefully written letters could be used with telling effect, are not giving this phase of their activities the attention it deserves. The railways are apparently making little systematic effort, either by supervision or training, to lift their correspondence to the level of that of other organizations of similar size and importance, or even to the level of the efficiency of the operating routine of some of their other departmental activities.

Railroads are not beginning to use the postal service as they should for the purpose of getting business. They are depending too much on the foot work of their solicitors. They are not keeping pace with other business concerns in the important matter of routine correspondence, as may be easily seen by a random comparison of railroad letters with those of other industries. If this were a situation difficult to overcome there would be ample excuse for indifference, but improvement would be easy and in very much greater proportion than the effort involved in securing it.

The specimen letter quoted at the beginning of this article is not to be construed as a "horrible" example. Its motive is to be commended and indicates considerable initiative on the part of the writer. Even so, it fell short of its opportunities. Redrafted it might read like this:

"The Elite Distributing Co.,  
New Orleans.

"Gentlemen: I am glad to tell you that L & N 6711, packing cases for the Jobbers Supply Co., Charleston, S. C., which was forwarded from New Orleans June 27, reached destination June 30 and was delivered July 2nd.

"Many thanks for routing this car over our line. I think you will agree that the service was good, but this is the schedule we usually maintain between New Orleans and Charleston and I hope you will instruct that future business for this and other destinations in the Southeast be routed in connection with the X Y Z Railroad."

When it is considered that almost every clerk in the various railroad offices writes his own letters and that these letters are frequently the only point of contact between the railroad and the individual to whom they are addressed, and automatically convey the attitude and policy of the railroad itself to the addressee, it would seem to be a worth-while investment for the railroads to institute a comprehensive control of correspondence. This could be done by gradually building up the understanding on the part of their clerical forces of the important part that correspondence plays, not only in molding the public's opinions and building up that intangible thing known as good will, but in the more immediate and practical consideration of securing immediate business, which in the final analysis is the factor that pays wages and dividends.

The experiment of a trained correspondent, who at the same time understood some of the fundamentals of salesmanship, to supervise and standardize railroad letter writing, would certainly be worth trying. Such a man would more than justify himself immediately and be a revelation after a few months' work in any part of a railroad's many correspondence activities.



## General News Department

A testimonial dinner to Sir Henry Thornton, president of the Canadian National, was tendered by executive officers of the company in Montreal on the evening of February 21.

The annual dinner of the American Railway Engineering Association which will be held at the Congress Hotel, Chicago, on Wednesday evening, March 11, will be addressed by James C. Davis, director general of the United States Railroad Administration, and Frank H. Alfred, president of the Pere Marquette. A number of special features will also be introduced at this dinner. The addresses will be broadcast.

E. W. Beatty, president of the Canadian Pacific, was the principal speaker at the annual dinner of the New York Traffic Club on February 21. He sketched the history of the Canadian Pacific and the Canadian National, referring to his company's interest in the latter as the largest taxpayer in Canada, and told of the close relationship existing between Canadian and American railways; he closed with an optimistic prophecy for the future of Canada and its railroads.

Harry Harmount of the Harmount Tie & Lumber Company, Chillicothe, Ohio, has been elected treasurer of the National Association of Railroad Tie Producers in place of E. E. Boehne, manager of sales of the International Creosoting & Construction Company, Galveston, Tex., who was elected to this position at the annual convention of this association in Chicago on February 6, as reported in the *Railway Age* of February 14, page 415, but who has been unable to serve.

Under the terms of a bill recently introduced in the senate of the Idaho Legislature, the governor of that state would be empowered to spend \$20,000 of state funds in a survey to determine the practicability of a railroad 250 miles long to connect north and south Idaho. The contemplated line would start at Centerville, about 25 miles from Boise, and would extend north via Grimes Pass, Deadwood River; Pine Basin and Salmon River to Stites, which is the southern terminus of the Clearwater Short Line of the Northern Pacific.

### Soo Line Offers Prizes for Shop Ideas

Six prizes totalling \$100 have been offered by the Minneapolis, St. Paul & Sault Ste. Marie to its employees in the car and locomotive departments for the best ideas for improving and facilitating shop practice. First prizes of \$25, second prizes of \$15 and third prizes of \$10 are offered to the employees of each department. The competition will close on April 1.

### Cost of War to Mexican Railways

Losses aggregating approximately \$4,000,000 were suffered by the National Railways of Mexico on account of raids by revolutionists during the 10-year period from 1914 to 1924, according to a report by E. O. Llano, a director of the railway. The report was submitted to President Calles of Mexico for use in deciding whether to continue government operation of the National Railways or to return them to private owners. According to the report, the railways as a whole are in fairly good condition and adequately supplied with rolling stock. This is said to be particularly true of the trunk lines leading to the border terminals of Laredo, Tex., and El Paso.

### Canadian Government Railways and Ships Owe Government \$154,000,000

The Canadian National Railways and the Canadian Government Merchant Marine were the principal debtors to the Dominion in the fiscal year of 1923-24, according to the report of the Auditor-General of Canada tabled in the House of Com-

mons last week. The government transportation systems owed the Dominion in the fiscal year 1923-24 more than \$154,000,000, which was an increase of \$53,000,000 over the previous fiscal year. The Department of Railways and Canals was a little over \$55,000 in arrears, which was one-third of the arrears in 1921.

### Inspect Sites for Los Angeles Station

Five sites for the proposed union passenger terminal at Los Angeles, Cal., were lately inspected by the citizens' committee of that city, of which William G. McAdoo, former director general of railroads, is a member. The locations being considered are the Plaza in the business district, the Southern Pacific station, the Pacific Electric station at Sixth and Main streets, an area adjacent to the Los Angeles river at Sixth and Seventh streets and another on North Broadway. The committee was appointed by the railroad commission of California to assist in solving the union terminal problem which has been before the public for many years.

### Report of Locomotive Inspection Bureau

The Bureau of Locomotive Inspection of the Interstate Commerce Commission inspected 6,298 locomotives during January, of which 3,054 were found defective and 354 were ordered out of service, according to the commission's monthly report to Congress on the condition of railroad equipment. The Bureau of Safety during the month inspected 99,425 freight cars, of which 3,265 were found defective and 2,137 passenger cars, of which 24 were found defective. Thirteen cases involving 36 violations of the safety appliance acts were transmitted in January to various United States attorneys for prosecution. During the year 1924, 31,446 locomotives were inspected, of which 14,617, or 46 per cent, were found defective.

### Manitoba Wants More Taxes from C. N. R.

It was announced in Winnipeg by Premier John Bracken of Manitoba that that province's suit against the Canadian National seeking a return on the gross earnings of the system within the province and payment in full of claims due under the Taxation of Railways Act would be pressed, and that Herbert J. Symington, counsel for the province, has been asked to obtain a decision as soon as possible. Although certain tax payments under the act have been made by the railway to the Manitoba government, the latter deems the amounts paid as insufficient. The case hinges on the point whether the Canadian National, being owned by the government, is exempt from taxation altogether. Mr. Symington stated he was awaiting from the railways answers to a series of questions he had submitted to them on this subject.

### "All Alive in '25!"

This is the slogan of the Safety Department of the Long Island Railroad, as set forth in the latest circular of the department. The discipline and morale of forces of the Long Island having resulted in going eight months, in one year, without a fatal accident to an employee, the fact is characterized as a very good reason for united efforts now to do the same thing for twelve months. Continuing, the circular says:

What do you owe to yourself? "Self Preservation." To your family, the moral obligation of protection to yourself and to them.

The big idea for 1925 is one we can all accept—the hope and belief that when the Old Year Passes Out in December, 1925 we can say, "Thank God, every Long Island Railroad man is still alive!"

A "Score Board" record of lost time injuries is called for, to be

posted conspicuously by each department—and a record kept for each month. Prize for the best record, on a basis of man-hours worked, will be awarded at the close of the year, the particular form of prize to be determined by the General Safety Committee.

### Trade Commission Recommends

#### Meat Refrigerator Car Company

In a report on the packer consent decree submitted to the Senate by the Federal Trade Commission in response to a Senate resolution, the commission recommends the divorcement of the "Big Five" packing companies from their control of refrigerator cars through the formation of a single company, similar to the Pullman Company, entirely independent of the control of the packers, both in law and in fact, to take over ownership and operation of these cars, making them available on equal terms to all meat packers and other food distributors. The large packing companies, it is stated in the report, have a practical monopoly of the meat refrigerator cars operated on the railroads of the United States. The report also recommends that steps be taken either by the courts or by Congress, finally to separate the packers from

their ownership of stockyards. Although five years have elapsed since the "big five" packers were ordered to dispose of their stockyard holdings, they have disposed of less than one-fourth of the par value of such holdings. Armour & Co. and Swift & Co. are the principal packers still holding large interests in stockyard companies.

The report summarizes briefly the divergent economic interests involved in the question of packer participation in so-called unrelated lines, particularly canned goods, fruits and general groceries.

### Program of Signal Section Meeting

The following is the program of the principal discussions to be held at the meeting of the Signal Section of the American Railway Association, at Drake Hotel, Chicago, on March 12 and 13.

Thursday morning: Reports of sub-committee on regulations; of Committee 2 on mechanical interlocking; of Special committee on highway crossing protection, and of Committee 5 on instructions.

Thursday afternoon: Committee 4, direct current automatic block signaling; Committee 6, designs; Committee 11, chemicals; Committee 8, alternating current automatic block signaling; Com-

### OPERATING REVENUES AND OPERATING EXPENSES OF CLASS I STEAM ROADS IN THE UNITED STATES

(FOR 192 STEAM ROADS, INCLUDING 16 SWITCHING AND TERMINAL COMPANIES)

Item	United States		Eastern District		Pocahontas Region		Southern Region		Western District	
	1924	1923	1924	1923	1924	1923	1924	1923	1924	1923
	1924	1923	1924	1923	1924	1923	1924	1923	1924	1923
Average number of miles operated	236,190.11	235,825.26	59,483.90	59,310.60	5,458.07	5,154.58	38,388.84	38,451.68	132,859.30	132,608.40
Revenues:										
Freight	\$362,367,917	\$344,140,097	\$156,693,801	\$155,646,030	\$19,905,667	\$14,882,081	\$50,934,826	\$46,466,088	\$134,833,623	\$127,145,898
Passenger	90,845,195	101,118,419	42,914,952	46,113,746	2,154,634	2,461,019	13,851,220	15,534,038	31,924,389	37,009,616
Mail	9,959,230	9,286,559	3,753,491	3,502,458	216,934	216,752	1,461,161	1,282,224	4,537,644	4,285,125
Express	15,059,619	13,230,544	6,299,169	5,908,530	329,986	262,833	2,303,764	1,666,821	6,126,700	5,398,360
All other transportation	16,876,747	15,962,760	8,804,878	8,855,627	222,445	215,575	1,274,052	999,099	6,569,372	5,892,459
Incidental	9,769,354	10,222,767	4,882,064	5,343,941	392,255	428,854	1,168,980	1,179,094	3,326,055	3,270,878
Joint facility—Cr.	940,308	890,454	383,454	403,041	22,430	19,447	138,649	150,906	395,775	317,060
Joint facility—Dr.	289,420	236,885	163,875	129,190	3,136	3,265	30,940	30,176	91,469	74,254
Ry. operating revenues	505,522,950	494,614,715	223,567,934	225,644,183	23,241,215	18,483,296	71,091,712	67,242,094	187,622,089	183,245,142
Expenses:										
Maintenance of way and structures	59,539,536	61,780,042	25,989,202	27,324,708	3,060,604	1,772,054	8,935,651	9,501,535	21,554,479	23,181,745
Maintenance of equip't	105,099,394	113,318,429	51,555,140	58,614,366	5,370,810	5,079,290	13,038,590	12,881,048	36,134,854	36,743,725
Traffic	8,634,235	8,236,784	3,151,568	2,979,148	207,427	206,785	1,684,052	1,611,424	3,591,188	3,439,429
Transportation	190,129,054	187,042,543	87,577,191	89,773,151	6,380,558	6,041,205	24,698,012	24,156,910	71,473,365	67,071,277
Miscellaneous operations	4,248,037	4,201,721	2,046,168	2,061,887	85,510	91,615	502,744	433,778	1,613,615	1,614,441
General	14,555,686	15,194,364	6,541,521	7,122,649	467,242	413,978	1,909,654	1,937,183	5,637,269	5,720,554
Transportation for investment—Cr.	1,791,090	1,619,870	296,246	255,020	145,622	50,167	258,175	134,685	1,091,047	1,179,998
Ry. operating expenses	381,415,252	388,154,013	176,564,472	187,620,889	15,426,529	13,554,758	50,510,528	50,387,193	138,913,723	136,591,173
Net revenue from railway operations	124,107,698	106,460,702	47,003,462	38,023,294	7,814,686	4,928,538	20,581,184	16,854,901	48,708,366	46,653,969
Railway tax accruals	29,136,814	29,050,856	10,586,006	9,878,766	1,207,622	1,343,616	4,666,920	4,433,638	12,676,266	13,394,836
Uncollectible ry. revenues	433,565	608,013	81,414	82,006	130,996	2,440	113,786	265,717	107,309	257,852
Ry. operating income	94,537,379	76,801,831	36,336,042	28,062,522	6,476,058	3,582,482	15,809,478	12,155,546	35,924,791	33,001,281
Equipment rents—Dr. bal.	5,813,540	4,785,342	2,663,910	2,495,069	2,339,639	2,312,857	624,915	497,641	2,864,369	2,105,389
Joint facility rent—Dr. bal.	1,735,612	1,971,045	982,830	1,137,134	17,363	29,393	142,355	178,730	593,664	625,788
Net ry. operating income	86,988,227	70,045,544	32,689,302	24,430,319	6,798,344	3,865,946	15,033,218	11,479,175	32,467,363	30,270,104
Ratio of expenses to revenues (per cent.)	75.45	78.48	78.98	83.15	66.38	73.34	71.05	74.93	74.04	74.54
FOR TWELVE MONTHS ENDED WITH DECEMBER, 1924 AND 1923										
Average number of miles operated	236,304.56	236,134.85	59,483.03	59,354.59	5,459.01	5,449.68	38,359.06	38,439.81	133,003.46	132,890.77
Revenues:										
Freight	\$4,347,916,272	\$4,625,786,003	\$1,911,756,415	\$2,146,464,743	\$199,614,936	\$190,490,179	\$81,501,495	\$93,189,762	\$1,655,043,426	\$1,695,641,319
Passenger	1,076,615,373	1,147,577,634	524,379,636	547,835,520	24,745,976	27,046,373	147,674,787	156,723,106	379,814,974	415,972,635
Mail	97,968,330	92,923,884	37,337,780	34,470,549	2,451,517	2,215,472	13,929,030	13,243,025	44,250,003	42,994,838
Express	143,705,417	152,955,826	62,413,666	69,758,895	3,236,862	3,412,179	19,595,523	19,285,276	58,459,366	60,499,476
All other transportation	193,327,576	200,053,945	109,933,210	116,765,510	2,243,825	2,204,416	11,644,883	11,609,476	69,505,658	69,474,543
Incidental	119,162,182	133,684,556	60,545,845	71,644,006	4,114,912	4,368,584	12,833,329	13,123,116	41,688,096	44,548,850
Joint facility—Cr.	10,432,565	10,138,394	4,360,777	4,622,478	188,714	178,561	1,557,064	1,534,308	4,326,010	3,803,077
Joint facility—Dr.	2,635,595	2,697,029	1,323,033	1,406,604	28,706	39,118	372,488	386,626	911,368	864,681
Ry. operating revenues	5,986,492,120	6,360,423,213	2,709,404,296	2,990,155,097	236,568,036	229,876,646	788,343,623	808,321,443	2,252,176,165	2,332,070,027
Expenses:										
Maintenance of way and structures	802,322,886	821,912,978	331,642,586	351,928,311	34,244,110	28,691,094	112,058,063	114,897,165	324,378,127	326,396,408
Maintenance of equip't	1,270,119,592	1,473,564,764	606,511,945	741,307,828	58,792,478	60,989,467	159,861,936	174,741,365	445,013,230	496,526,104
Traffic	99,082,513	94,194,661	37,165,755	35,096,743	2,488,967	2,278,549	17,410,331	17,056,422	42,017,460	39,762,947
Transportation	2,180,084,066	2,352,021,895	1,031,692,021	1,139,752,341	71,416,838	75,505,183	280,852,099	296,271,613	797,023,108	840,492,778
Miscellaneous operations	50,437,545	50,851,865	24,038,984	24,617,709	1,005,327	999,276	4,969,502	4,694,519	20,423,732	20,540,361
General	169,084,264	164,267,122	74,737,241	73,742,750	5,368,596	4,897,635	21,956,783	21,425,068	67,021,644	64,199,669
Transportation for investment—Cr.	13,723,085	11,675,887	1,900,895	1,620,169	557,607	299,427	1,957,726	1,292,327	9,306,857	8,463,964
Ry. operating expenses	4,558,307,781	4,945,135,398	2,103,887,637	2,364,825,513	172,758,709	173,061,777	595,090,951	627,793,825	1,686,570,444	1,779,454,283
Net revenue from railway operations	1,428,184,339	1,415,287,815	605,516,659	625,329,584	63,809,327	56,814,869	193,252,632	180,527,618	565,605,721	552,615,744
Railway tax accruals	344,075,226	337,334,429	137,782,990	138,625,858	14,085,897	12,768,897	45,006,311	42,195,637	147,200,028	143,744,037
Uncollectible ry. revenues	2,327,265	2,081,793	931,242	770,624	176,241	67,370	301,466	420,239	918,316	821,560
Ry. operating income	1,081,781,848	1,075,871,593	466,802,427	485,933,102	49,547,189	43,978,602	147,944,855	137,911,742	417,487,377	408,048,147
Equipment rents—Dr. bal.	73,392,541	70,277,029	41,814,911	42,523,854	4,080,229	4,955,503	4,011,597	7,032,773	31,646,262	25,675,905
Joint facility rent—Dr. bal.	21,255,890	21,858,339	11,013,755	11,690,396	1,101,744	1,237,642	1,380,267	1,114,523	7,766,124	7,815,778
Net ry. operating income	987,133,417	983,736,225	413,973,761	431,718,852	52,525,574	47,696,463	142,552,991	129,764,446	378,080,991	374,556,464
Ratio of expenses to revenues (per cent.)	76.14	77.75	77.65	79.09	73.03	75.28	75.49	77.67	74.89	76.30

a Includes \$2,944,628 sleeping and parlor car surcharge. b Includes \$3,121,281 sleeping and parlor car surcharge. d Deficit or other reverse items. c Includes \$37,023,556 sleeping and parlor car surcharge. e Includes \$37,497,255 sleeping and parlor car surcharge.

(Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.)



mittee 9, overhead and underground lines; Committee 10, signaling practice. Also on Thursday afternoon there is scheduled a paper on the relation of airbrakes to automatic train control.

The only two items thus far scheduled for Friday are the report of Committee 1, on economics of railway signaling, and papers on train operation by signal indication.

### "Always Be Careful"

The foregoing is the title of Educational Bulletin No. 8, a two-color poster, 18 in. by 24 in., which has been prepared by the Safety Section of the American Railway Association, and for which Secretary J. C. Caviston, 30 Vesey street, New York City, will receive orders until March 10. If the railroads order as many as 3,000 copies of this poster the cost will be 4 cents a copy; if 10,000 copies, 3 cents a copy. The substance of the mes-



sage on the poster is to the effect that 522 railroad employees in the United States were killed in 1923 by being struck by locomotives or cars, and 793 injured; and 24 were killed and 2,571 injured in the same period while operating hand brakes. The poster bears three large halftone engravings illustrating the dangers referred to. One of these pictures is shown herewith.

### Fatal Collision at Manhattan Transfer

In a rear collision of westbound passenger trains on the Pennsylvania Railroad at Manhattan Transfer, N. J., on the morning of Tuesday, February 24, about 9:35, three employees were killed and nine employees and 23 passengers were injured. Train No. 185, the Atlantic Coast Line Express, standing at the station, was run into at the rear by train No. 219, crushing the rear car of the standing train, which was a dining car; and overturning that car and the colliding locomotive. Two men who were coupling hose at the forward end of the standing train were instantly killed and a cook in the kitchen of the dining car was crushed to death, his body somewhat burned, being extricated only after five hours' work. Some of the injured were scalded when the dining car overturned, by water from the kitchen tanks. Five of the injured employees were sent to hospitals, but a statement issued by the railroad said that none of the injured passengers required medical attention.

Both trains consisted wholly of steel cars. The locomotive of

No. 219 was an electric motor. From train 185 the electric motor had just been cut off.

Five miles an hour is the highest speed allowed within the yard limits of this station, but the locomotive of No. 219 crushed the dining car for 15 ft. or more, indicating that the speed must have been much above the limit.

The dining car took fire, but the flames were soon extinguished with buckets of water. Extinguishers from the station waiting rooms were used, but were not sufficient.

Motorman Joseph A. Keilt and his helper jumped off, and Keilt escaped severe injury. The helper had to go to the hospital. Keilt was indicted on Wednesday on a charge of manslaughter and was held in \$10,000 bail. His case will come before the Grand Jury of Hudson County, New Jersey. He made a statement to the effect that he duly applied the brakes, but that they did not check the speed; and the president of the New Jersey Public Utility Commission is quoted as being inclined to accept the statement, conjecturing that the angle cock next behind the locomotive had accidentally become closed. Witnesses are quoted as saying that as the train approached the point of collision the drivers of the locomotive were seen to be locked while on the cars the brakes were not holding.

### Three Enginemen of the Glacier Park Limited

The three men here shown, Messrs. John, Frank and William Maher, have served the Great Northern Railway 129 years, an average of 43 years each, and their ages aggregate 178 years, believed to be a record for brothers in the same service. They are all locomotive engineers on trains No. 3



The Maher Brothers

Left to Right: Frank, William, John

and No. 4. In the order of the faces shown in the photograph, the respective ages, the years of service and the age at entrance are:

Frank	59	45	14
William	55	38	17
John	64	46	18

They began as call boys or helpers. John and William run on the Willmar division and Frank on the Fergus Falls division.

### Sir Henry Thornton on Canadian Politics

A statement on his position with respect to the leaders of the three main parties in the Canadian Parliament was made last week by Sir Henry Thornton, president of the Canadian National, speaking in Montreal.

"There is a good deal of talk about politics in the railway, or the absence of them. Much depends upon who is doing the talking. I am convinced that the leaders of the three political parties in Canada want politics kept out of the railway and they are quite sincere in this desire. Insofar as the government is concerned the Prime Minister and the Minister of Railways have in no sense endeavored to hamper me with political interference. In the heat of a political battle there is always a tendency to draw in the railway. That is a mere detail. The point is that it is not done with studied intent by

any of these leaders. My job is to sit tight and keep everybody where they belong. There are a certain number of people, I think a small majority, who will accuse this or any other administration of doing something it should not do. That minority, I think, we may safely ignore."

There were different schools of thought in Canada concerning the freight rates question, said Sir Henry. In the West there was the feeling that the Crow's Nest Pass Agreement should be restored in its entirety, but such feeling was probably not so strong in the East. He said he had no quarrel with that agreement, but Canada could not continually reduce freight and passenger rates and simultaneously and continually increase net earnings. Left to itself, the growth of the gross earnings of the Canadian National would be slow but steady, although he did not think Canada was going to have any large increase in that respect. Railway income would increase in proportion to the prosperity of the country.

### Delegates to International

#### Railway Congress in London

A number of railroads have chosen their delegates to the International Railway Congress in London this June. Several railroads, which hold memberships in the International Association, are not planning to send delegates to the London meeting. Others have not yet named their delegates. The following list of American railroad men who will attend the London meeting is, therefore, preliminary:

H. J. Forster, secretary and treasurer, American Railway Association.  
W. G. Besler, president, Central of New Jersey.  
Samuel O. Dunn, editor, *Railway Age*.  
Dr. Julius Parmelee, director, Bureau of Railway Economics.  
S. M. Felton, president, Chicago Great Western.  
W. R. Scott, president, Southern Pacific, Texas Lines.  
J. T. Wallis, chief of motive power, Pennsylvania.  
J. W. Roberts, general superintendent of transportation, Eastern region, Pennsylvania.  
H. M. Carson, general superintendent, Central Pennsylvania division, Pennsylvania.  
H. E. Newcomet, general superintendent, Lake division, Pennsylvania.  
W. C. Cushing, engineer of standards, Pennsylvania.  
Agnew T. Dice, president, Reading.  
R. B. Abbott, assistant general superintendent, Reading.  
S. T. Wagner, chief engineer, Reading.  
G. J. Ray, chief engineer, Delaware, Lackawanna & Western.  
Colonel J. T. Loree, vice-president and general manager, Delaware & Hudson.  
A. C. Needles, president, Norfolk & Western.  
W. J. Jenks, vice-president (operation), Norfolk & Western.  
C. S. Churchill, vice-president (purchases, real estate and valuation), Norfolk & Western.  
J. E. Crawford, general manager, Norfolk & Western.  
W. P. Wiltsee, chief engineer, Norfolk & Western.  
A. Kearney, superintendent of motive power, Norfolk & Western.  
E. W. Beatty, K. C., president, Canadian Pacific (probably).  
Donald Rose, European traffic agent, Central of Georgia.  
Sir Henry W. Thornton, president, Canadian National.  
S. J. Hungerford, vice-president, Canadian National.  
A. E. Warren, general manager, Canadian National.  
R. A. C. Henry, director, Bureau of Economics, Canadian National.  
E. P. Mallory, director, Bureau of Statistics, Canadian National.

Of the above, Messrs. Wallis, Cushing, Wagner, Ray and Loree will present reports to the congress. Messrs. Forster, Besler, Parmelee, Dunn, Felton and Scott will attend as representatives of the American Railway Association. Names of other delegates to the congress will be published in the *Railway Age* when notice is received of their appointment.

### Canadian Railways Minister Asks

#### Parliament to Leave Rates Alone

Almost an entire day of the Canadian House of Commons this week was devoted to discussion of a motion "that in the opinion of this House, the mountain freight scale should be abolished, insofar as it is reflected in standard mileage rates, class rates and commodity rates." Before a vote on the issue could be taken Monday evening E. M. Macdonald, Minister of National Defence, moved the adjournment of the debate "so that before the matter comes up again, or before the government deals with the question in a general way, we may have the advantage of further information."

A statement on the position of the Federal Government in regard to equalization of freight rates throughout Canada was made in the debate by George P. Graham, Minister of Railways and Canals, who spoke, in part, as follows:

"This question of freight rates is most embarrassing and most technical. Although I have been in the Railway Department at different times for a great many years, I profess to know mighty little about it. It is something any person can take up in his own locality and feel that the rate is not fair. At the present time railway rates are not in a satisfactory condition—everybody admits that. The Railway Act says there should be no unjust discrimination, and it is claimed there has been discrimination. That matter is before the courts now. I think it is a serious mistake at this moment for any member of Parliament, or Parliament itself, to take too severe an attitude towards the railways. As far as the Canadian National Railways are concerned, there can be no question about there being no dividends on that road, and I want to call attention to the fact that every man in this House is a joint proprietor of the Canadian National Railways. I might add further that the revenues of the Canadian Pacific Railway, as well as those of the Canadian National Railway, all come out of the impost on the traffic, whether it be passenger or freight, so that there is not so much difference between the upkeep of the railways as some people sometimes imagine.

"Although one is under private control or private ownership, yet it has no source of revenue except the pockets of the people who patronize it, and the Canadian National Railways is in the same position. \* \* \* In fairness to the Canadian railways, I may say that they have this handicap that their fuel costs them more in a large section which they traverse than does fuel in the United States, and still on through traffic they have to compete with United States railways that can be run more cheaply. It has been said that Canadian railways should reduce rates of wages and other conditions have been mentioned. Rates of wages for men engaged in any employment in Canada will never go back to where they were before the war, and it is not in the best interest of the country that they should, because the standard of living for men who work with their hands must be kept at a point where they will be able to live in comfort. We cannot do much in the line of reducing wages. Further than that, even if that was desired, Canadian railways and American railways are so interlocked in their traffic that what applies to one side of the line must of necessity apply to the other, and I see no way of getting around that. \* \* \*

THE ATLANTIC CITY RAILROAD has applied to the Interstate Commerce Commission for authority to abandon its line from Ocean City Junction to Sea Isle City, N. J., 8.1 miles.



Track Near Top of Central Cordillera, Antioquia, Colombia



## Traffic News

The hearing on a petition of western cattle shippers to lower livestock freight rates from the states west of the Mississippi river which ended in Kansas City, Mo., on February 7, will be resumed in Chicago on March 30 and a final hearing will be held in Galveston, Tex., on April 20.

The ferry of the Long Island Railroad between its terminus at Long Island City, N. Y., and 34th street, Manhattan, is to go out of business at midnight on March 2. Since the diversion of the principal current of passenger traffic to the Pennsylvania station, New York, by way of the tunnel beneath the East River, the business of this ferry has fallen off, and for the past twelve months only one boat has been in use. The service was kept up only at a great loss, and the abandonment is approved by the State Transit Commission. This ferry was established in 1868, and was taken over by the Long Island, when that company absorbed a number of other railroad lines, under the presidency of Austin Corbin.

The Illinois Central on February 21 ran four special trains carrying 525 passengers, and two extra sections of the Panama Limited, to carry visitors to the Mardi Gras at New Orleans, La. Under the all-expense tour plan employed by the Illinois Central for Mardi Gras celebrations for several years past the special trains are parked within a short distance of the heart of the city and the passengers are given during the layover all facilities of a hotel including laundry, pressing, cleaning, taxicabs, telegraph and dining car service. The tour includes automobile sight-seeing trips, steamboat excursions on the Mississippi river and sight-seeing trips through the National Military Park at Vicksburg. A new feature of the plan this year is a two-day stopover at Hot Springs on the return.

### Maritime Provinces Again Protest

#### Against C. N. R. Routing via New England

In every session of the Canadian Parliament the Canadian National Railways are under the fire of members of both the House and the Senate, those members being largely confined to the opposition. J. B. M. Baxter of St. John, N. B., a cabinet minister in the last Conservative administration at Ottawa, concluding the debate on the Throne Speech in the House last week, scolded the management of the government railway system for not exerting greater energy in having the freight it moved pass through Canadian, instead of United States ports.

"Does the government realize our position in the Maritime provinces?" asked Mr. Baxter. "Does it realize that when we complained in this House of the shipment of automobiles through New London, Conn., we were first put off with explanations, and that explanations were then sent to the newspapers from the head of the government railways to the effect that they were doing everything in their power to carry out the bargain with the people of Canada, that every pound of freight should be routed by Canadian rails through Canadian ports, and that the Canadian National Railways were doing everything to implement the declaration of Sir Wilfrid Laurier? More than that, the St. John Telegraph-Journal sent two emissaries across Canada and they found shippers who declared that not only had they not routed their goods through American ports, but that they had never been asked by a representative of the Canadian National Railways to route them through Canadian ports. We had been led to believe by the very people in charge of the national railways that there was a deep-rooted hostility in the Western part of Canada to the use of the ports of the Eastern provinces, and now our investigators find that the trouble is somewhere else. As to the railway question generally, all I ask is that the heads of the two railways shall be asked to sit in a conference and discuss the means by which a combination of the respective systems may be operated more profitably and with less expense."

## Commission and Court News

The resignation of Mark W. Potter as a member of the Interstate Commerce Commission has been accepted by the President effective on February 20, it was announced by the commission on that date. The Senate committee on interstate commerce has taken no action regarding the confirmation of Thomas F. Woodlock, who was nominated by the President to succeed Mr. Potter, and it is understood that there will be no confirmation until after the new Senate comes in on March 4.

### Increased Divisions for K. C. M. & O.

The Interstate Commerce Commission, after a further hearing, has issued an order modifying the findings in its original order in the Kansas City, Mexico & Orient divisions case, which was enjoined by the courts. The commission now prescribes an increase in divisions to be accorded to that carrier by its connections somewhat less than the increases previously ordered. The findings are in part as follows:

(1) That the general finding of the former report to the effect that the Orient is a necessary transportation agency, the efficient service of which should be continued in the public interest, should be affirmed; (2) that the Orient is operated with reasonable efficiency; (3) that its report of railway operating income for the year 1923 does not fairly reflect the results of normal operation, the revenues having been increased by temporary measures and its expenses for maintenance understated; (4) that its cost per unit, including use of capital, for the transportation of interstate joint freight traffic has been heretofore, is now, and for the immediate future will be, greater than that of its connections for handling the same joint traffic; (5) that the divisions of interstate joint freight rates, except as noted on traffic interchanged with its immediate connections, hereinafter named, are, and, since September 15, 1922, have been, unjust, unreasonable and inequitable; (6) that just, reasonable and equitable divisions of such joint rates accruing to the Orient for the period since September 15, 1922, on traffic having origin or destination on the Orient, have been, and for the future will be, not less than the divisions accruing to the Orient on present bases, on traffic interchanged with the immediate connections, respectively, plus the following percentages, except in cases where the division accruing to the Orient is greater than the division accruing to its connection, in which cases the Orient should receive divisions which are not less than the divisions accruing to it under present bases, plus the same percentages of the divisions accruing to the said connections:

For the Abilene & Southern .....	12 per cent
For the Atchison, Topeka & Santa Fe .....	20 " "
For the Chicago, Rock Island & Pacific .....	16 " "
For the Fort Worth & Denver City .....	24 " "
For the Galveston, Harrisburg & San Antonio .....	20 " "
For the Gulf, Colorado & Santa Fe .....	24 " "
For the Midland Valley .....	16 " "
For the Missouri-Kansas-Texas of Texas .....	16 " "
For the Missouri Pacific .....	16 " "
For the St. Louis-San Francisco .....	16 " "
For the Texas & Pacific .....	16 " "

(7) that just, reasonable, and equitable divisions of such joint rates accruing to the said connecting lines for the period since September 15, 1922, on said traffic, have been, and for the future will be, the divisions accruing to said lines on present bases, less the amounts by which the divisions accruing to the Orient should be increased, as aforesaid; (8) and that on traffic as to which the Orient is an intermediate carrier the percentages should be one-half of those above named.

An order will be entered requiring an adjustment of divisions for the past and for the future in accordance with the aforesaid findings. The order will not be applicable to divisions of rates subject to the differentials hereinbefore mentioned, either for the past or the future, or to divisions of rates subject to the aforesaid arbitraries except from and after March 31, 1925.

The record does not support a conclusion that the divisions of interstate joint freight rates on traffic interchanges with the Clinton & Oklahoma Western or the Wichita Falls & Northwestern are, or will be inequitable. The line of the last-named company has since April 1, 1923, been operated as part of the Missouri-Kansas-Texas. If any of the divisions prescribed are believed to operate unreasonably, to the injury of any participating carrier, such situation may be called to the attention of the commission.

Commissioner Hall dissents.

## Labor News

Representatives of the railroad labor organizations meeting in Chicago on February 20 decided to discontinue their support of the "Conference for Progressive Political Action," which is sponsored by Senator Robert M. LaFollette. Of the 16 unions represented, only three advocated continued support of the LaFollette party. It was decided to maintain a non-partisan attitude in political campaigns in the future. Withdrawal also of the Socialist party support from the LaFollette organization left the Wisconsin senator virtually without backers.

An eight-hour day for telegraphers on the Pennsylvania has been established by the Railroad Labor Board. According to the decision, eight consecutive hours' work, exclusive of the meal hour, with certain exceptions, shall constitute a day's work. At small non-telegraph or non-telephone agencies where service is intermittent, eight hours' actual time on duty within a spread of 12 hours shall constitute a day's work. The rate of pay for overtime is to be one and one-half times the basic rate. The decision on the employees' request for wage advances was withheld by the board until the receipt of additional information as to the wages now paid on the Pennsylvania.

### The Pennsylvania and Its Telegraphers

The conference between officers of the Pennsylvania Railroad and representatives of its telegraphers, held in Philadelphia last week (*Railway Age*, February 21, page 484) was dissolved on Saturday; but the representatives to act on the permanent joint reviewing board had not been chosen, and another conference is to be held on March 9.

The railroad company announced after the conference that a memorandum of understanding to carry into effect the company's plan of employee representation as a basis for future wage adjustments had been signed, providing for a joint reviewing committee, on which there will be eight men representing the telegraphers and the same number representing the management. This committee will be a court of last resort and its operation will be like that of similar reviewing committees in other departments.

The conference also worked out a schedule of meetings for the various committees. Informal discussion is said to have indicated that one of the first questions to be brought up will be a request for increased wages, two weeks' annual vacation with pay and one day off each week.

### Investigation of Labor Board Asked in Congress

Charges that "certain members of the United States Railroad Labor Board are incompetent and inefficient, and that they have neglected their duties and have used the government funds for other than government business," are made by Representative Mead of New York in a resolution introduced in the House by Representatives on February 23, calling for an investigation of the board and its "failure to protect the interests of the general public" by the House committee on interstate and foreign commerce. A few days before he had introduced a resolution calling for an investigation by a select committee appointed by the Speaker of the House from the members of the Sixty-Eighth Congress.

The second resolution states that "I am also informed" that a "certain member" of the board is connected in a business way with a corporation dealing with railroad supplies, and that this member has been paid by said corporation certain sums of money for services rendered contrary to law; that certain members of the board, while en route to investigate a complaint filed with the board by railroad employees, accepted the offer of a carrier "to occupy and enjoy the comforts of a private car set aside by said carrier for the use of its executive officers"; that a certain member of the board has delegated his authority to minor employees of the board to prepare decisions on important complaints; that a certain member failed to attend at least one-fourth of the executive sessions of the board during the year 1924; and that the board accepted invitations to attend banquets given by railroad officials' clubs at distant points, "involving great expense which by the action of the board was paid by government moneys."

## Foreign Railway News

### New High-Speed Line Proposed for Italy

LONDON.

A plan has been presented to the government of Italy for the construction of an electric railway to link up Milan with Turin, and Genoa with Turin and Milan, thus enclosing the great industrial and commercial zone of Northern Italy in a high-speed railway triangle, according to the Times (London) Trade Supplement. The memorandum which accompanies the scheme, after emphasizing the great advantages which Italy's greatest industrial and financial centre would obtain from the projected railway, outlines the principal features of the scheme.

It is proposed to run trains at a speed of about 115 miles an hour. The service would be hourly at first, and later on probably a 15-minute service. Thus the journey between Turin and Milan would occupy only 57 minutes, including two intermediate stops. The journey between Genoa and Turin and Milan and Genoa would occupy a similar time.

In addition to the railway it would be opportune to construct a triangle of motor-road between the three centres to afford a rapid means of concentration of passenger and vehicular traffic from inside and outside the triangle. This traffic would feed the railway. Nor does this ambitious scheme stop here. Plans are also included for a similar line to Rome by way of Spezia and Pisa by means of which the journey could be made in four hours, this extension, however, to be carried out after the first lines have given satisfaction. The scheme also contains details as to tariffs and fore-shadows some very low rates.

### China Notes—Graduates of American University in Responsible Positions

PEKING.

Though actual fighting ceased over two months ago, the railways are still far from being restored to normal conditions. An interregnum continued for about a month following the Feng Yuxiang *coup d'état*, being merely masked by the presence of a "rubber-stamp" organization in the Ministry of Communications. Immediately following the assumption of the chief executive authority by the veteran Tuan Chi-jui, Yeh Kung-cho was appointed Minister of Communications. Yeh will be remembered by a few American railway executives from his visit to America with Dr. C. C. Wang in 1918 and 1919. He is the active leader of the Communications "clique" and has been Minister and Vice-Minister of Communications about half of the period of the Republic.

As a concession to the "Anfu Club" following of Tuan Chi-jui, Cheng Hung-nien has been appointed Vice-Minister of Communications. Cheng was director of the railway department of the same Ministry during the last days of the Anfu Club's ascendancy in 1920. But for director of the railway department, Minister Yeh has chosen C. S. Liu, a graduate of the University of Pennsylvania, and considered by those close to the service as being the ablest railway executive in China. Liu worked his way up from a clerkship to the directorship of the railway department during the ten years preceding Wu Peifu's victory in 1922. After Wu's victory, Liu refused to resign his position, insisting that the director of the railway department should be considered a technical officer rather than a political appointee. This effort to take the railways out of politics was fruitless, however, for Wu caused Liu's arrest and detention for several weeks. No charges could be substantiated and he was released to become chief accountant of the Bank of China.

With the encouragement of Minister Yeh, Director Liu has brought about a conference between the representatives of the military units occupying the railways and the officers of the railways, with H. Y. Hu, chief of the traffic section of the Ministry, acting as chairman. Mr. Hu is also a graduate of the University of Pennsylvania.

The expedient of getting permission from the military to use a certain portion of the equipment failed entirely. Then the subject was taken up from a different angle, that of marking certain of



the cars and locomotives as being reserved for "commercial service only." In this way proportional releases have been secured from the different military commands and the traffic committee now gives public assurance that freight train service equivalent to thirty per cent of normal will be maintained. It is expected that the mercantile community will fare slightly better than that, for with a knowledge of the situation many of them will be able to hire service direct from the various military commanders. The result will be that the military commanders will get the revenue instead of the railways.

As an example of the dislocation of service, a communiqué from the traffic committee states that of 225 locomotives on the Peking-Mukden line, 83 are now in the hands of the militarists and 33 are on other lines (also in the hands of the army). Thus 116 are lost to the use of the line and of the 109 remaining many are dead at way stations and undoubtedly require extensive firebox and boiler repairs before they can be put into service. On the Peking-Mukden line about three-fifths of the passenger train service has been restored; on the Peking-Suiyuan, Tientsin-Pukow and Peking-Hankow lines about two-fifths has been restored.

The unity of the Peking-Mukden line has been regained, Tan Wen-kao (Chang Tso-lin's former appointee) having been made Managing Director of the entire line. The traffic on the Mukden Section had not been interrupted seriously by war conditions for the entire train movement had been confided to the railway officers. Earnings of about \$30,000 a day had been enjoyed. As soon as Chang Tso-lin left Mukden for Peking, the discipline went to pieces, so it is reliably reported, and collections dropped to \$5,000 a day. This fact is very significant of the whole situation in China today, not only on the railways but in other connections.

### Miscellaneous

The following brief items have been received by the Bureau of Foreign and Domestic Commerce from government representatives in various parts of the world:

Rates have been increased 30 per cent on Austrian Federal Railways for both passenger and freight traffic effective January 1.

A new railroad will be built in Cape Province, South Africa, from Klaver to Kokenaap, a distance of 40 miles.

An extensive report on the market for rail-motor vehicles in Brazil, by A. Ogden Pierrot, United States trade commissioner at Rio de Janeiro, may be obtained on request from the Transportation division of the Bureau of Foreign and Domestic Commerce.

A new railway from Libau, Latvia, to Mitau will be constructed in the next three fiscal years. The necessary cost will be included in the budgets and 1,560,000 lats (\$301,080) has already been set aside in the 1925-26 budget.

The electrification of the Paris-Orleans section of the Paris-Orleans Railway is expected to be completed during the present year, and will be the first important step in the electrification of the Paris-Orleans Railway.

The National Railways of Mexico have been called upon for a statement of losses since the revolution, in connection with the agitation of the question as to whether they should be returned to private ownership.

A sum of \$192,800 (1,000,000 zloty) for the reconstruction of the Lublin-Rozwadow Railway (Poland) is included in the 1925 budget of the Polish Ministry of Railways. The line, which was built during the war by both Germans and Russians, forms a connecting link between Warsaw and Lemberg. The work will probably be done by the Polish Railway Ministry.

Direct railway communication between Poland, Switzerland and Italy and the improvement of present rail communication between Poland and contiguous states is the object of a conference of representatives of the railways of Czecho-Slovakia, Germany, Austria, Hungary, Italy and Switzerland, which opened at Warsaw on January 8.

The requirements of the Railways of India during 1924-25 are much less than was originally estimated. During the current fiscal year only 60 locomotives will be needed, and it is considered doubtful if the requirements for any one of the next five years will exceed 100 locomotives. This compares with an estimate submitted in 1921 that the average annual requirements would be 160 locomotives and 160 additional boilers during 1923-24, and thereafter 400 locomotives and 400 additional boilers.

## Equipment and Supplies

### Locomotives

THE CHICAGO, BURLINGTON & QUINCY is inquiring for 13 Mountain type locomotives.

### Freight Cars

THE CARNEGIE STEEL COMPANY is inquiring for 50 gondola cars of 50 tons' capacity.

THE FORD MOTOR COMPANY has ordered 20 dump cars from the Mount Vernon Car & Manufacturing Company.

THE INLAND STEEL COMPANY has ordered 50, 70-ton air dump cars from the Western Wheeled Scraper Company.

THE EVERETT DISTILLING COMPANY has ordered 10 tank cars of 8,000 gal. capacity from the American Car & Foundry Company.

THE AMERICAN REFRIGERATOR TRANSIT COMPANY has ordered 5 refrigerator cars from the American Car & Foundry Company.

THE PERE MARQUETTE has ordered from the Pressed Steel Car Company 11 steel underframes for caboose cars. Inquiry for these underframes was reported in the *Railway Age* of January 31.

THE REPUBLIC IRON & STEEL COMPANY is inquiring for two quenching cars. This company is also inquiring for 8 steel gondola car bodies, as was reported in the *Railway Age* of February 21.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered 1,200 box cars and 400 gondola cars from the American Car & Foundry Company. This company was reported in the *Railway Age* of January 24 as inquiring for this equipment.

THE PIEDMONT & NORTHERN is in the market to buy 150 automobile cars either complete or to be fabricated in the railroad company's shops at Greenville, S. C. These cars are to be standard 40-ft., 100,000 lb. capacity with steel frame and superstructure, roof and ends.

### Passenger Cars

THE HAVANA CENTRAL is inquiring for 8 interurban cars.

THE NEW YORK CENTRAL is inquiring for about 70 cars for passenger service.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 40 milk cars from the Standard Steel Car Company.

THE HYDRO-ELECTRIC COMPANY OF TORONTO, CANADA, is inquiring for 10 steel interurban cars for electric service.

THE ST. LOUIS-SAN FRANCISCO has ordered 10 baggage cars from the American Car & Foundry Company. Inquiry for this equipment was reported in the *Railway Age* of February 14.

### Iron and Steel

THE CHESAPEAKE & OHIO is arranging for the purchase of 30,000 tons of rail, which will probably be placed in June.

THE WARASH has divided an order for 5,000 tons of rail between the Inland Steel Company and the Illinois Steel Company.

THE ATCHISON, TOPEKA & SANTA FE has divided an order for 12,300 tons of rail between the Inland Steel Company and the Illinois Steel Company.

THE NEW YORK CENTRAL has exercised its option and ordered 29,650 tons of rail divided as follows: Inland Steel Company, 3,000 tons; Illinois Steel Company, 12,000 tons, and Bethlehem Steel Corporation 12,850 tons, all of 105 lb. sections; Carnegie Steel Company, 1,800 tons of 115 lb. sections. The New York

Central placed orders last October for 155,000 tons of rail and took an option on 29,650 additional, which option it is now exercising.

## Machinery and Tools

THE ILLINOIS CENTRAL is inquiring for one 90-in. driving wheel lathe, one 54-in. tender truck wheel lathe, and one 90-in. driving wheel journal turning lathe, and is preparing a list of 50 machine tools.

## Miscellaneous

THE NEW YORK, CHICAGO & ST. LOUIS is inquiring for 3,000 tons of tie plates.

THE DELAWARE, LACKAWANNA & WESTERN has given a contract to the John W. Sullivan Company, New York, for the construction of two steam tugboats. The hull and boilers will be built by the Bethlehem Shipbuilding Corporation.

## Signaling

THE BALTIMORE & OHIO has ordered from the Hall Switch & Signal Company 12 color-position-light signals, to be installed at Grafton, W. Va.

THE ST. LOUIS-SAN FRANCISCO has ordered from the Union Switch & Signal Co., a Saxby & Farmer interlocking, 20 levers, for installation at the crossing with the Kansas, Oklahoma & Gulf, at Baxter Springs, Kan.

THE BALTIMORE & OHIO has ordered from the General Railway Signal Company material for automatic train control, three-speed continuous indicative type, to be installed on its line from Baltimore, Md., to Washington, D. C., 38 miles, double track.

THE LONG ISLAND has let a contract to the Union Switch & Signal Co., for the installation of interlockings at Babylon, N. Y., and Bethpage, N. Y., with track circuit over the seven mile line, single-track, between these two places. The machine at Babylon is to be electro-pneumatic, 23 levers, and that at Bethpage is to be mechanical with a 24 lever frame; and traffic control is to be provided for between the two interlockings. At Babylon the machine will operate 19 switches and 24 signals.

THREE MILLION DOLLARS is the saving, according to estimates made by officers of the company, which the New York, New Haven & Hartford could make in one year if shippers would load cars as nearly to their full capacity as was done in 1920; and that sum of money would greatly assist the company in the enlargement and improvement of its facilities for furnishing good freight service. This is the gist of a leaflet which has been issued for the public to read. The calculation is in brief as follows: The average load of freight per car in 1920 was 24.9 tons; four years later 21.9 tons, a decrease of 12 per cent. If the average of 1920 had been reached in 1924, no less than 3,873 fewer cars would have been required; and these cars, costing one dollar a day, would amount to a cost in one year of \$1,400,000; and by not using the cars that sum would be saved. The freight could have been hauled with 800,000 fewer train miles; saving these train miles at two dollars each would mean \$1,600,000. These two savings, added together, total \$3,000,000. The New Haven road in 1924 moved its freight cars 21 miles a day, an increase of 68 per cent over the average movement in 1920.

## Supply Trade News

The Chicago Metal Packing Company, Chicago, has changed its name to the Chicago Rhopac Products Company.

The Moline Foundry Company, Moline, Ill., has changed its name to the Moline Foundry & Machine Company.

Harry S. Smith has been appointed railroad sales representative for the McMaster-Carr Supply Company, with headquarters in Chicago.

C. R. Naylor, sales agent of Symington Company at 2108 Straus building, Chicago, has been appointed manager western sales, effective February 16.

The Yost Manufacturing Company, Meadville, Pa., has opened an office and warehouse at 25 South Jefferson street, Chicago, with H. S. Huncke in charge.

The Orton & Steinbrenner Company, Chicago, has appointed the William M. Bailey Company, Pittsburgh, Pa., representative for Pittsburgh and surrounding territory.

A. C. Cook, general sales manager of the Warner & Swasey Company, Cleveland, Ohio, has been promoted to vice-president and has been elected also a member of the board of directors.

E. R. Kenner, assistant sales manager of the Wellman-Seaver-Morgan Company, Cleveland, Ohio, has been appointed special representative of the H. K. Ferguson Company, Cleveland, Ohio.

Walter S. Austin, mill representative of A. M. Castle & Co., with headquarters at Chicago, has been appointed general manager of sales for the Los Angeles Iron & Steel Company, Los Angeles, Cal.

The Premier Equipment Corporation, Houston, Tex., has been organized to take over the Houston Railway Car Company and will repair, buy and sell locomotives, cars, and other railway equipment.

W. R. Guinn, former manager of the fuel oil department of the Combustion Engineering Corporation, New York, has been appointed Pacific Coast agent, with headquarters at San Francisco, Cal. Mr. Guinn's territory will include Washington, Oregon and California.

Russell Lord, president and manager of the Ayer & Lord Tie Company, Chicago, died on February 23, in that city after a two weeks' illness. He became associated with the company in 1913 and worked in the production and timber preserving departments until 1917 when he entered the army. During the war he was captain in the 33rd division of artillery. In 1919 he was elected president of the company, which position he has held until his death.

John R. Olsen, general sales manager of the Central Electric Company, Chicago, has been promoted to vice-president and general sales manager, Louis Siskind, merchandise manager, has been promoted to vice-president and merchandise manager; Jacob M. Lorenz, manager of railroad sales, has been promoted to vice-president and manager of railroad sales; Benjamin J. Kacin, superintendent, has been promoted to vice-

## LOCOMOTIVE REPAIR SITUATION

Date, 1924	No. locomotives on line	No. serviceable	No. stored serviceable	No. req. classified repairs	Per cent	No. req. running repairs	Per cent	Total req. repairs	Per cent
February 1	64,377	53,586	4,116	5,919	9.2	4,872	7.6	10,791	16.8
April 1	64,363	52,805	4,648	6,128	9.5	5,430	8.4	11,558	17.9
July 1	64,416	53,382	7,117	6,035	9.4	4,999	7.7	11,034	17.1
October 1	64,538	53,209	5,424	6,175	9.6	5,154	8.0	11,329	17.6
January 1, 1925	64,384	53,118	4,849	5,927	9.2	5,339	8.3	11,266	17.5
February 1, 1925	64,308	52,994	4,220	6,143	9.6	5,171	8.0	11,314	17.6

Data from Car Service Division reports.



president and superintendent and **Griscom Bettie**, store manager, has been promoted to vice-president and assistant to the president.

### Chicago Railway Equipment Company

The annual report of the Chicago Railway Equipment Company for 1924 shows a surplus or undivided profit of \$1,479,137 as compared with \$1,494,588 in 1923 after the payment of dividends of \$209,775 on the 7 per cent preferred stock and \$179,808 on the common stock. Additions to capital assets to the amount of \$161,538 were provided out of the year's earnings.

### Suit Between Brown Instrument Company and Republic Flow Meters Company Settled

The suit brought by the Brown Instrument Company in the Federal Court at Chicago against the Republic Flow Meters Company and certain individuals has been settled between the parties; and certain suits at law brought by the Republic Flow Meters Company and the same individuals in the same court against Richard P. Brown have been dismissed.

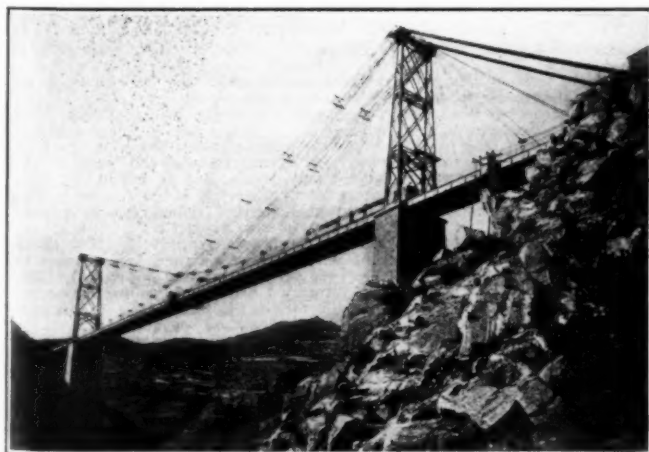
The officers of the Republic Flow Meters Company did not wish to be under the imputation of illegally using any of the original construction of the Brown instruments. It having been called to their attention that there were pending on behalf of the Brown Instrument Company patent applications covering some of these features, the Republic Flow Meters Company has changed the construction of its indicating and recording pyrometers for the purpose of avoiding infringement either of patents or of original design or construction of the Brown Instrument Company.

## Obituary

**Fernando C. Runyon**, treasurer of the Rail Joint Company, New York, died at his home in Great Neck, L. I., on February 24.

**Frank F. Coggin**, who died on February 15, at Boston, Mass., as was mentioned in the *Railway Age* of February 21, was born in February, 1848, at Milford, N. H. He joined the United States Navy, at the age of 16 and after serving one year during the Civil War, enlisted in the United States Army, 165th New York Volunteers, Second Duryea Zouaves. In 1867 he entered the service of the Old Colony Railroad as a fireman. He subsequently served as locomotive engineer on that road, the Milwaukee & St. Paul and the Boston & Lowell. In 1898 he was appointed air brake and steam inspector on the Boston & Maine; two years later he resigned to go to the Maine Central as road foreman of engines. He left railway service in 1902 to enter the steam heating business as manager of the Economy Heating Company. In 1905 he went with the Chicago Car Heating Company and in 1917 with its successor, the Vapor Car Heating Company, Inc., as New England manager, which position he held until the time of his death.

\* \* \* \*



Railway Bridge in the Pyrenees

## Railway Construction

**BALTIMORE & OHIO.**—A contract has been awarded to the Vang Construction Company, Cumberland, Md., for constructing a subway at Virginia avenue, Cumberland; cost, approximately 225,000. Bates & Rogers, Cleveland, Ohio, have a contract for the construction of a bridge at Snowden, Pa.; cost, approximately \$120,000.

**CAROLINA, CLINCHFIELD & OHIO.**—Additions and new equipment for this company's shops at Erwin, Tenn., to cost approximately \$500,000, have been authorized. New buildings to be constructed include: a blacksmith shop, 90 ft. by 156 ft.; a coach, carpenter and paint shop, 100 ft. by 264 ft.; a freight car repair shop, 103 ft. by 396 ft.; and a wash and locker room for car department employees. Work will start at once and be completed this year.

**COLORADO & SOUTHERN.**—This company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the installation of an electric cinder handling plant at Trinidad, Colo.

**DELAWARE, LACKAWANNA & WESTERN.**—The 6.77 mile line which the Interstate Commerce Commission has authorized this company and its subsidiary, the Morris & Essex, to construct in Bergen and Essex counties, New Jersey, as was noted in the *Railway Age* of February 21, will cost approximately \$2,135,360, or more than \$315,000 a mile—about 60 per cent of which will be for grading, bridges, trestles and culverts. Construction will begin by March 1, this year, and will be completed by December 1, 1926. This line will extend from Kingsland, N. J., to Harrison, connecting two of the D. L. & W.'s main lines, one primarily a freight line and the other primarily a passenger line. The main function of the new line will be to bring the freight line and classification yard at Secaucus in easier access with the industrial area around Newark, N. J., which is at present served only by the company's passenger line.

**MISSOURI-KANSAS-TEXAS.**—This company has awarded a contract to the Graver Corporation, East Chicago, Ind., for the erection of a water softener, with a capacity of 15,000 gal. per hr., at Wichita Falls, Tex.

**MISSOURI-KANSAS-TEXAS.**—This company's plans for constructions and betterments in 1925 include the construction of concrete piers and pile trestle approaches to a bridge on the Houston division at a cost of \$50,000, to be done partly by company forces and partly under contract; additional trackage at Springtown, Okla., to be constructed by company forces at a cost of \$21,000; additional car sidings and cinder pit at McKittrick, Mo., to be built by company forces at a cost of \$30,000; replacement of a 341-ft. trestle with creosoted ballast deck trestle on the Dallas division, to be done by company forces at a cost of \$19,000; and replacement of a 314-ft. trestle with a concrete structure on the Dallas division at a cost of \$24,500, to be done under contract.

**SAN ANTONIO & SAN ANGELO.**—This company, of which L. J. Gould, of San Antonio, Tex., is chief engineer, has awarded a contract to Paul Hanson, of San Antonio, Tex., for the construction of a new line from San Antonio to Medina Lake, a distance of 40 miles.

**SOUTH PLAINS & SANTA FE.**—This company has applied to the Interstate Commerce Commission for authority to construct an extension from Doud, Tex., west through Lubbock, Hockley and Cochran counties, 65 miles.

**TEXAS & PACIFIC.**—This company will soon call for bids for the construction of a yard and engine terminal facilities at Alexandria, La., to be used jointly with the Missouri Pacific. This project will cost approximately \$1,000,000. A contract has been awarded to the List Construction Company, Kansas City, Mo., for the grading for a new yard and engine terminal facilities at Shreveport, La., the entire project to cost \$925,000. The contract for concrete subways and culvert in connection with the work at Shreveport, has been awarded to C. H. Johnson, Dallas, Tex. Bids will soon

be asked for the construction of a new yard and engine facilities at Dallas, Tex., to cost a total of \$960,000.

**UNION TANK CAR COMPANY.**—This company plans the construction of a car repair shop at Toledo, Ohio.

**WABASH.**—This company has accepted the plan of engineers for the city of St. Louis for the elimination of the grade crossing in that city at Delmar boulevard to be accomplished by constructing a viaduct for street traffic over the railroad tracks. The Wabash had proposed to eliminate the crossing by carrying the tracks over the street. This plan was disapproved by the Public Service Commission of Missouri and on appeal by the Supreme Court of that state. In addition to the grade crossing elimination at Delmar boulevard, the plan includes the construction of separated crossings at DeBaliviere avenue, Union boulevard, Waterman avenue and Kingsbury boulevard. At all of these crossings the streets will be carried over the railroad tracks. At Olive street another grade will be eliminated by constructing the Wabash tracks over the street. It is estimated that it will require six years to complete the work.

### Rock Island Projects to Cost Almost Three Million

The Chicago, Rock Island & Pacific contemplates the construction of the following facilities: A second main track from McFarland, Kan., to Latimer, a distance of 42 miles, to cost \$1,200,000; a branch line from Billings, Okla., to Ponca City, approximately 40 miles, to cost \$854,000; a grain elevator at Council Bluffs, Iowa, to cost \$200,000; a freight terminal at Omaha, Nebr., to cost \$250,000; a passenger station at Tucumcari, N. Mex., to cost \$35,000; track elevation in Chicago, to cost \$300,000; a coal chute at Topeka, Kan., to cost \$30,000; an electric shop at Chicago, to cost \$17,000, and car shops at El Reno, Okla., to cost \$15,000. While tentative plans for these projects have been made they have not yet been formally authorized.



Ewing Galloway

Railway Station at Lisbon, Portugal

## Railway Financial News

**AKRON, CANTON & YOUNGSTOWN.**—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to execute a general and refunding mortgage for \$4,000,000 and to issue \$750,000 of 6 per cent bonds, to be sold to F. R. Sawyer & Co., of Boston, at 90.

**CINCINNATI, INDIANAPOLIS & WESTERN.**—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to issue and sell \$702,000 of first mortgage 5 per cent 50-year bonds and to pledge them pending sale.

**DELAWARE & NORTHERN.**—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon a branch line from Andes Junction to Andes, N. Y., 8½ miles.

**DELAWARE, LACKAWANNA & WESTERN.**—*1924 Earnings.*—The annual report issued in preliminary form this week shows for 1924 net after charges of \$14,099,060, as compared with \$12,378,001 in 1923. The 1924 net earnings were equivalent to \$8.34 per share (\$50 par value) on the outstanding capital stock; the 1923 earnings were at the rate of \$7.32 per share.

The statement for 1924 with comparison for 1923 follows:

	1924	1923
<b>Revenues:</b>		
Coal .....	\$23,576,425	\$25,151,010
Merchandise .....	39,874,878	39,085,364
Passengers .....	13,600,454	14,185,914
<b>Total including other .....</b>	<b>\$86,727,184</b>	<b>\$88,236,974</b>
<b>Expenses:</b>		
Maintenance of way and structures ...	\$7,745,720	\$7,663,064
Maintenance of equipment .....	18,699,630	21,239,075
Transportation expenses .....	34,091,817	36,750,177
<b>Total expenses including other—</b>	<b>74.35% .....</b>	<b>\$69,467,853</b>
<b>Net revenue from operation .....</b>	<b>\$22,241,275</b>	<b>\$18,769,120</b>
<b>Railway tax accruals .....</b>	<b>6,900,102</b>	<b>5,995,698</b>
<b>Operating income .....</b>	<b>\$15,328,663</b>	<b>\$12,751,170</b>
<b>Add additional income:</b>		
Joint facility rent income .....	\$145,592	\$139,070
Hire of equipment—Cr. ....	451,707	852,759
Dividend income .....	505,566	571,664
Income from funded securities .....	4,050,105	3,973,793
<b>Total, including other .....</b>	<b>\$21,029,006</b>	<b>\$19,072,466</b>
<b>Deductions from income:</b>		
Rentals of leased roads .....	\$5,967,749	\$5,714,374
Interest on funded debt .....	5,856	5,856
Rental New York piers .....	348,156	348,284
Additions and betterments .....	569,808	503,136
<b>Total including other .....</b>	<b>\$14,099,060</b>	<b>\$12,378,001</b>
<b>Less dividends declared .....</b>	<b>11,821,754</b>	<b>10,132,932</b>
<b>Balance surplus .....</b>	<b>\$2,277,306</b>	<b>\$2,245,069</b>

**INTERNATIONAL-GREAT NORTHERN.**—*Offer to Holders of Adjustment Mortgage Bonds.*—William H. Williams, chairman of the board of the New Orleans, Texas & Mexico, has issued the following offer to holders of International-Great Northern, Series A, 6 per cent adjustment mortgage bonds:

"The New Orleans, Texas & Mexico has acquired the capital stock of International-Great Northern and offers to guarantee to holders of adjustment bonds accepting this offer a minimum distribution in accordance with the adjustment mortgage and adjustment bonds at the rate of 4 per cent per annum in respect of interest thereon for the interest period beginning January 1, 1924, and ending December 31, 1927, in consideration of the grant by the owner of each such assenting adjustment bonds of an option to New Orleans, Texas & Mexico to purchase such assenting bond, on like notice as is required by the adjustment mortgage for the redemption of adjustment bonds, at any time at the following prices, respectively, to wit: (a) If the date designated for such delivery be before January 1, 1928, at 85 per cent of the face amount thereof with interest on such face amount to the delivery date at the rate of 4 per cent per annum from January 1, 1924, or as the case may be, from the later January 1 beginning the interest period next succeeding the last interest period for which interest on the adjustment bonds, Series A, has been declared due and payable; (b) if the delivery date be on or after January 1, 1928, at the face amount thereof together with accrued and unpaid cumulative interest thereon to the delivery date (but only to the extent that coupons for such interest shall be surrendered with such bond) and also, if interest for the year ended December 31, 1927, shall not theretofore have been declared due and payable together with interest for the year at the rate of 4 per cent per annum.

"Holders of adjustment bonds desiring to accept these terms must present their bonds to Irving Bank-Columbia Trust Co. to be appropriately stamped. "Acceptance of the above offer is recommended by J. & W. Seligman &



Co., and Speyer & Co., the bankers who negotiated the agreement pursuant to which the offer is being made."

**NEW YORK, CHICAGO & ST. LOUIS.—Application Filed with Commission.**—The joint application of the New York, Chicago & St. Louis Railroad, the Chesapeake & Ohio, the Hocking Valley, the Erie, the Pere Marquette and the New York, Chicago & St. Louis Railway for authority for the latter company to acquire control of the systems of the other companies named, under paragraph 2 of section 5 of the interstate commerce act, by acquisition of a majority of the stock of each and by leases for 999 years, in accordance with the proposal announced last August, was filed with the Interstate Commerce Commission on February 21. Included in it was a separate application of the new company for authority to issue \$345,000,000 of stock, consisting of 1,550,500 shares of 6 per cent cumulative preferred stock and 1,899,500 shares of common stock, upon authorization by the commission of control of the systems of the other companies, including the amounts to be exchanged for the stocks of the lessor companies in accordance with the plan and an amount to be held in the treasury. The application stated that sufficient stockholders of each company have become parties to the agreement to insure approval of the plan and that the new company intends to operate all of the railroads now operated directly by each of the lessor companies.

The reasons given by applicants to show that such control will be in the public interest include the following:

"Under the plan there will be created a single system comprising approximately 9,160 miles of road. The lines are complementary and supplementary and, from the standpoint of physical situation and traffic handled, logically lend themselves to unification and operation as a single system. The chief competitors for traffic between Chicago and the middle west and New York are the New York Central, Pennsylvania, and Baltimore & Ohio. The acquisition of control of the lessor companies as proposed will bring a fourth real competitor into this field. The unified control and operation will insure improved handling of grain moving from the west to New York and other eastern ports, relieving the Nickel Plate and Pere Marquette from embargoes at Buffalo and elsewhere against such traffic which have been imposed by their eastern connections in times of congestion. "The acquisition of control as proposed will open direct routes between points of origin and destination for a large volume of present and future traffic; will reduce the number of operating companies; will increase the competitive strength of such routes; will bring about a better co-ordination between the lines comprising those routes; will simplify their relations to the traveling and shipping public in the conduct of business and in the settlement of claims, and to public authorities, state and federal, having jurisdiction thereover; will result in the substitution of one-line hauls for two-or-more-line hauls; will make possible a better balancing of the volumes of traffic moving in opposite directions over the various lines of the unified system; will bring about more efficient and dependable service to the public; will make possible the unification of standards and practices; and will promote convenience and simplicity and effect great economies in operation and in accounting."

The application stated that the aggregate stocks of the lessor companies is \$390,320,855, whereas the maximum amount of stocks of the new company issuable in exchange for that of the lessor companies will be but \$282,568,642, or \$107,752,212 less than the amount of outstanding stock. It was also stated that the proposed acquisition of control would be in harmony with the policy and purposes of the transportation act and with the recommendations made in the commission's annual reports to Congress for the years 1918 and 1919. The application comprises 549 pages, consisting mainly of exhibits giving complete details of the proposed leases and the method of exchanging stock of the new company for that of the old companies.

**SEABOARD AIR LINE.—Bonds.**—This company has applied to the Interstate Commerce Commission for authority to pledge \$1,500,000 of first and consolidated mortgage 6 per cent bonds as collateral security for short term loans.

**SOUTHERN RAILWAY.—New Directors.**—Jackson E. Reynolds and Walter S. Case have been elected directors succeeding Charles Lanier and George T. Slade.

### Dividends Declared

**Boston & Albany.**—Two per cent, quarterly, payable March 31 to holders of record February 28.  
**St. Louis Southwestern.**—Preferred, \$1.25, quarterly, payable March 21 to holders of record March 14.

### Trend of Railway Stock and Bond Prices

	Feb. 24	Last Week	Last Year
Average price of 20 representative railway stocks .....	82.84	81.07	61.84
Average price of 20 representative railway bonds .....	90.81	90.05	83.58

## Railway Officers

### Financial, Legal and Accounting

**Albert Ward**, general attorney of the Monongahela, with headquarters at Pittsburgh, Pa., has been appointed assistant general solicitor of the Pennsylvania, with headquarters at Philadelphia, Pa., effective March 1.

### Operating

**J. H. Johnson**, whose promotion to acting superintendent of the Fargo division of the Northern Pacific, with headquarters at Dilworth, Minn., was reported in the *Railway Age* of February 7, was born on July 17, 1873. He entered railway service in April, 1900, as a telegraph operator on the Fargo division of the Northern Pacific, in which capacity he later served at various points. He was promoted to train dispatcher at Glendive, Mont., in May, 1905, and was promoted to chief dispatcher at Glendive in August, 1908. Mr. Johnson was promoted to trainmaster, with headquarters at Mandan, N. Dak., in May, 1910, and was later transferred to the Fargo division and then to the St. Paul division. He was promoted to assistant to the general superintendent of the Eastern district, with headquarters at St. Paul, Minn., in January, 1918, in which position he remained until his recent promotion to acting superintendent of the Fargo division.

**C. McNay**, whose promotion to assistant to the general manager of the Missouri Pacific, with headquarters at St. Louis, Mo., was reported in the *Railway Age* of February 14, was born



C. McNay

on November 5, 1883, at Lima, Ill. After attending a business college at Quincy, Ill., he entered the service of the Missouri Pacific in 1904 as secretary and chief clerk to the master mechanic at Kansas City, Mo. He was promoted to trainmaster in 1905 and in the following year was promoted to division superintendent, with headquarters at Osawatomie, Kans. Mr. McNay was promoted to general superintendent, with headquarters at Kansas City, Mo., in 1908 and held that position until 1912 when he was promoted to superintendent of transportation, with

headquarters at St. Louis, Mo. He was later promoted to assistant general manager, and then to general manager, which position he held until 1923, when he was appointed office manager to the vice-president and general manager. Mr. McNay continued in that position until his recent promotion to assistant to the general manager.

**John Cannon**, whose promotion to general manager of the Missouri Pacific, with headquarters at St. Louis, Mo., was reported in the *Railway Age* of February 14, was born on May 6, 1872, at Cairo, Ill. He entered railway service in 1886 as a laborer in the mechanical department of the Illinois Central and was later assigned to messenger and clerical work in the operating department. In May, 1892, he was promoted to chief clerk to the assistant superintendent of the Chicago division, and in 1894 was transferred to the office of the superintendent of the Amboy and St. Louis divisions. Mr. Cannon was appointed chief clerk to the general superintendent of transportation in December, 1901, and was promoted to assistant trainmaster of the St. Louis division in 1903. He was appointed chief clerk to the general manager in June, 1904, and in January of the following year was promoted to trainmaster of the Springfield and Chicago division.

He entered the service of the Missouri Pacific in October, 1905, as superintendent at Coffeyville, Kans. He was later transferred successively to Little Rock, Ark., DeSoto, Mo., Poplar Bluff, and Jefferson City. Mr. Cannon was promoted to general superintendent of the Eastern district, with headquarters at St. Louis in November, 1915, and held that position until May, 1917, when he was promoted to general superintendent of transportation. He was reappointed general superintendent of the Eastern district in January, 1919, and was reappointed general superintendent of transportation in April of the same year. He was promoted to assistant general manager on March 1, 1920, in which position he remained until his recent promotion to general manager.

### Engineering Maintenance of Way and Signaling

**R. E. Mohr** has been appointed architect in the office of the chief engineer of the Wabash, with headquarters at St. Louis, Mo., succeeding C. Hummel, deceased.

**A. A. Miller**, whose promotion to engineer maintenance of way and structures of the Missouri Pacific, with headquarters at St. Louis, Mo., was reported in the *Railway Age* of February 14, was born on September 28, 1879, at Zanesville, Ohio. After graduating from the Civil Engineering school of the Ohio State University in 1902, he entered railway service as a rodman on the Baltimore & Ohio. He was later promoted to assistant engineer, which position he held until January, 1907, when he was promoted to division engineer, with headquarters at Philadelphia, Pa. Mr. Miller was appointed chief engineer of the West Coast Company of Los Angeles, Cal., in September, 1907. He returned to railway service in June, 1909, as assistant engineer on the Missouri Pacific and was promoted to division engineer in June, 1911. He was promoted to district engineer in January, 1918, and was promoted to superintendent of the Missouri division in April, 1921. He was later transferred to the Memphis division, with headquarters at Wynne, Ark., where he remained until his recent promotion to engineer maintenance of way and structures.



A. A. Miller

**N. Crowe**, assistant engineer in the office of the chief engineer of the Wabash, with headquarters at St. Louis, Mo., has been promoted to division engineer of the Chicago Terminal division, with headquarters at Chicago, a newly created position. **J. C. Bousfield**, assistant engineer on the Springfield division, with headquarters at Springfield, Ill., has been transferred to the office of the chief engineer, with headquarters at St. Louis, succeeding Mr. Crowe. **V. R. Hayes**, track supervisor, with headquarters at Forrest, Ill., has been promoted to assistant engineer on the Springfield division, with headquarters at Springfield, succeeding Mr. Bousfield. **H. S. Howard**, assistant engineer on the Peru division, with headquarters at Peru, Ind., has been transferred to the Detroit division, with headquarters at Montpelier, Ohio, succeeding **J. S. Gamble**, transferred. **T. L. Roach** has been appointed assistant engineer on the Peru division, with headquarters at Peru, succeeding Mr. Howard.

### Traffic

**J. R. Mockbee**, whose promotion to assistant general freight agent of the St. Louis Southwestern Railway of Texas, with headquarters at Dallas, Tex., was reported in the *Railway Age* of February 21, was born in Omaha, Nebr., and entered railway service in 1900 as a call boy on the St. Louis Southwestern of Texas. He was subsequently promoted successively to telegraph

operator, local freight agent, traveling freight agent, commercial agent and division freight agent. He was serving in the latter capacity at Dallas, Tex., at the time of his recent promotion to assistant general freight agent.

**R. C. Hatfield**, who has been promoted to assistant general freight agent of the St. Louis-Southwestern of Texas, with headquarters at Ft. Worth, Tex., as was announced in the *Railway Age* of February 14, was born on June 30, 1869, at Dayton, Ohio, and entered railway service in October, 1889, in the operating department of the St. Louis-Southwestern. He was promoted to traveling freight agent in July, 1898, and in January, 1900, was promoted to commercial, freight and livestock agent, with headquarters at San Antonio, Tex. Mr. Hatfield was promoted to general agent at Ft. Worth, Tex., in July, 1904. In September, 1918, he was appointed chief clerk in the consolidated traffic office at Ft. Worth, where he remained until April, 1919, when he was promoted to district freight and passenger agent at Ft. Worth. He held that position until his recent promotion to assistant general freight agent.

### Special

The title of **W. H. Swift, Jr.**, has been changed from radio engineer of the Canadian National, with headquarters at Montreal, Que., to director of radio.

**M. Ghilain**, principal engineer of the Belgian State Railways, has been appointed general secretary of the Permanent Commission of the International Railway Congress Association, with headquarters at Brussels, Belgium, succeeding **J. Verdeyen**, deceased.

### Obituary

**Henry Collbran**, president of the Colorado Midland Terminal from 1893 to 1896, died in London, England, on February 15.

**J. Verdeyen**, general secretary of the Permanent Commission of the International Railway Congress Association, died recently at Brussels, Belgium, his headquarters.

**Louis Houck**, pioneer railroad builder of southeastern Missouri, died at Cape Girardeau, Mo., on February 19, at the age of 86 years. Mr. Houck built the first railroad, the Cape Girardeau Southeastern, into Cape Girardeau and other short lines with an aggregate length of 500 miles. These later were absorbed by the St. Louis-San Francisco.

**General James H. Wilson**, distinguished hero of the Civil war and in later wars, died at Wilmington, Del., on February 23, at the age of 87. He was noted also as a railroad engineer and administrator. He left the army at the end of 1870, and thereafter took part in the building of the St. Louis & Southeastern, the Cairo & Vincennes and other western roads. He was president of the first-mentioned road in 1873. Later he was chief engineer of the New York Elevated and (1878-83) president of the New York & New England. He returned to the army during the war with Spain (1898), and helped to suppress the Boxer uprising in China in 1900. He was the last survivor of the staff of General Grant. He was author of numerous historical works.

**H. T. Evans**, vice-president and controller of the Chicago, Indianapolis & Louisville, died at Bradentown, Fla., on February 21 after an illness of several months. Mr. Evans was born on February 2, 1874, at St. Clair, Pa., and entered railway service in 1888 in the accounting department of the Kansas City, St. Joseph & Council Bluffs, now a part of the Chicago, Burlington & Quincy. He was promoted to traveling auditor in July, 1897, and in August, 1899, to chief clerk in the auditor's office. When the Kansas City, St. Joseph & Council Bluffs consolidated with the Burlington in 1904, Mr. Evans was transferred to Chicago as chief clerk to the auditor of expenditures. He was promoted to auditor of expenditures in May, 1907, and held that position until June, 1911, when he entered the service of the Chicago, Indianapolis & Louisville as auditor. Mr. Evans was promoted to controller on December 1, 1920, and held that position until January, 1924, when he was elected vice-president and controller.